High Frequency-MFM-Imaging of Harddisk Write heads and Soft Magnetic Materials

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The high-frequency response of harddisk write heads is an important means for test purposes in the harddisk industry. Therefore, a technique called high-frequency MFM (HF-MFM) was developed recently [1,2]. The HF-MFM technique was found to be advantageous to other instruments for write head testing [3]. However, there are more possibilities for this technique as the basic principle can be employed also for the observation of the high-frequency response of other magnetic materials. Furthermore, the HF-MFM technique was only used as a quasi-commercial investigation tool, and did not receive further development.

In this project, a high-frequency MFM (HF-MFM) setup was built up on the basis of a commercial AFM system. To test the HF-MFM system, we employed harddisk write heads from IBM and SEAGATE. In order to obtain a HF-MFM image, the harddisk head is fed with a high-frequency current in order to produce a high-frequency magnetic field, which can interact with the magnetic cantilever of the MFM system. To separate the high-frequency part of the measurement signal from the low-frequency part, the high-frequency current is amplitude-modulated. Fig.1 (a) presents the HF-MFM field distrbution around a IBM harddisk head. HF-MFM images at frequencies up to 650 MHz have been successfully obtained.

For the further development of the HF-MFM technique, we prepared MFM tips with novel magnetic coatings like ferrites, where we expect a better performance in high-frequeny fields. We also tested the performance of high-aspect ratio MFM cantilevers [4,5] with the HF-MFM technique as shown in Fig. 1 (b). First results of HF-MFM imaging on permalloy samples will also be presented.

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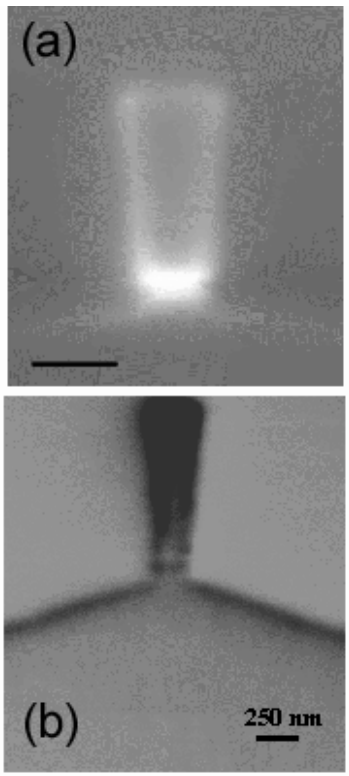

Figure 1 *(a) HF-MFM image of a IBM write head at f=100 MHz (marker = 2 µm) and (b) MFM image of SEAGATE write head using a high-aspect ratio tip from Nanoworld Services.*

References

[1] R. Proksch, P. Neilson, S. Austvold, and J. J. Schmidt, Appl. Phys. Lett. **74**,1308 (1999).

[2] M. Abe and Y. Tanaka, J. Appl. Phys. **98**, 6766 (2001).

[3] M. Abe and Y. Tanaka, IEEE Trans. Magn. **38**, 45 (2002)

[4] M.R.Koblischka, U. Hartmann and T. Sulzbach, Thin Solid Films **428**, 93 (2003).

[5] T. Sulzbach, C. Richter, C. Lehrer, this conference.