High-frequency MFM characterization of magnetic recording write poles

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A high-frequency MFM (HF-MFM) is built up for the observation of the high-frequency stray fields of harddisk write heads. An amplitude-modulated current was applied to the head coil to detect the force gradient induced by the HF magnetic field. The achieved spatial resolution is comparable to that of standard MFM when using advanced MFM cantilevers fabricated by means of focused-ion beam milling. This treatment yields a high-aspect ratio [1]. Dynamic HF magnetic fields emerging at the poles of the write heads were clearly imaged; especially along the P2 pole shape on the air-bearing surface. Recent harddisk write poles have overall dimensions of some micrometers in length, but only a width of ~300 nm. For the present measurements, write poles stemming from SEAGATE were used. The frequency dependence of the head-field distributions are measured up to 1 GHz using CoCr-coated MFM cantilevers. For further improvement of the HF-MFM imaging, we employed Z-type hexaferrites as a magnetic coating, which show a magnetic hysteresis at these frequencies of interest [2]. By means of these ferrite-coated cantilevers, a clear improvement of the HF-MFM images can be observed and images up to 2 GHz could be obtained.

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[1] M.R.Koblischka, U. Hartmann, T. Sulzbach, Mat. Sci. Eng. C 23 (2003) 747.
[2] A. Goldman: Modern ferrite technology, Van Nostrand, New York, 1990.

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