The 5th Joint MMM–Intermag Conference
Pittsburgh, Pennsylvania, USA
June 18–21, 1991
MA–05

The 5th Joint MMM-Intermag Conference

Pittsburgh, Pennsylvania
June 18–21, 1991

10:06

MA-05 HIGH AREAL BIT DENSITY PERPENDICULAR MAGNETIC RECORDING ON HARD DISK

Setsuo YAMAMOTO, Hiroaki MURAOKA, Yoshihisa NAKAMURA
Research Institute of Electrical Communication, Tohoku University
2–1–1, Katahira, Aoba–ku, Sendai 980, JAPAN

We investigated a new contact perpendicular hard disk system to derive tremendous potential of perpendicular magnetic recording. In this system, the modulation of a reproduced signal, pass-wear durability and high density recording characteristics are much improved[1]. This paper describes the feasibility of high areal bit density recording based on the experimental data.

To investigate the possibility of high linear bit density recording, phase margin analysis was firstly performed at data transfer rate of 10Mbits/sec using MFM coding. The error rate of 10^{-9} was obtained without any equalizations and write compensations at 110kFRPI using a 100μm trackwidth and 0.2μm main-pole-thickness single-pole head. At this density, the $S/N_{(p-p/rms)}$ was 40dB and the pattern peakshift for "110" pattern reached 14% of a window width. Suppression of pattern peakshift is effective to make the phase margin larger. It was found that the available linear bit density can be increased to 200kBPI by introducing 2/7 code and an equalizer which transforms asymmetric reproduced waveforms to symmetric waveforms.

Secondly, the feasibility of narrow track recording was studied using the single-pole heads with several trackwidth from 6.5μm to 100μm. It was found that the reproducing sensitivity of the single pole-head increases with decreasing trackwidth[2]. The reproducing sensitivity of 6.5μm trackwidth head reaches $154nV_{o-p}$/[turn*μm*(m/s)] at low density, the S/N of 33dB was obtained at 50kFRPI. From the data of trackwidth dependency of S/N, the S/N for 5μm trackwidth at 10Mbits/s is estimated at 27dB. Assuming 14% pattern peakshift, the error rate of 10^{-9} is possible even for 5μm trackwidth[3].

We conclude that the available areal density will exceed 1Gbits/in^2 (200kBPI, 5μm trackwidth), when 2/7 code and the equalizer are introduced.

1. *Y. Nakamura, K. Ouchi, S. Yamamoto, I. Watanabe: IEEE Trans. Magn., vol.26, no.5, pp.2436–2438 (1990).*
2. *K. Takano, Y. Nakamura: 5th Joint MMM–Intermag (1991). (to be presented)*
3. *Y. Tahara, Y. Miura, Y. Ikeda: Trans. IECE, vol.J59–C, no.10, pp.607–614 (1976).*