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PERPENDICULAR RECORDING BY A NARROW TRACK SINGLE POLE HEAD

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Introduction

In order to obtain a high storage capacity in magnetic recording, it is effective to increase track density as well as linear density. In a perpendicular magnetic recording, the high linear density over 150kMRPI could be realized by using a Co-Cr double-layer medium and a single-pole type (SPT) head(1). This paper describes the feasibility of high track density recording in this system.

Magnetic Fields of Narrow Track SPT Head

The side-fringing field of the SPT head, which limits the obtainable track density, was measured by using a large scale model of head and recording medium. Fig.1 shows the profiles of (a) perpendicular and (b) longitudinal field for the SPT head and ring type head, respectively. It became evident that, at the region outside the track, the side-fringing field of SPT head decays more sharply than that of a conventional ring type head and the field strength near the main pole increases as the track width decreases.

When the medium approaches to the top of main pole, the field strength increases and the field distribution becomes sharper than Fig.1, because of a strong magnetic interaction between the main pole and the medium. The facts mean that, from a magnetic point of view, a very narrow track recording can be made by a SPT head.

The tendency was ascertained by the observation of Bitter patterns on a surface of Co-Cr film after recording by the narrow track (6.5μm) SPT head. In the experiment, the recorded track width accurately coincided with the width of a main pole, and the magnetization transition in the transverse direction of the track was found to be as sharp as that of bits in the longitudinal direction.

Recording and Reproducing Properties

Above results represent that the crosstalk signal from an adjacent track becomes very small in the perpendicular recording. Experimental verification was carried out by measuring the reproduced voltage as the head was displaced to the side of a recorded track. It was proved that, for a digital signal, there is less crosstalk even at long wavelengths in perpendicular recording as compared with the conventional longitudinal recording, and furthermore, that the reduction of the output level due to the displacement from the track is almost independent of the density of recorded signal, because the harmonics of reproduced digital signal decay at the same rate as the fundamental component. This is quite contrasted with the longitudinal recording. It was also confirmed that the reproduced

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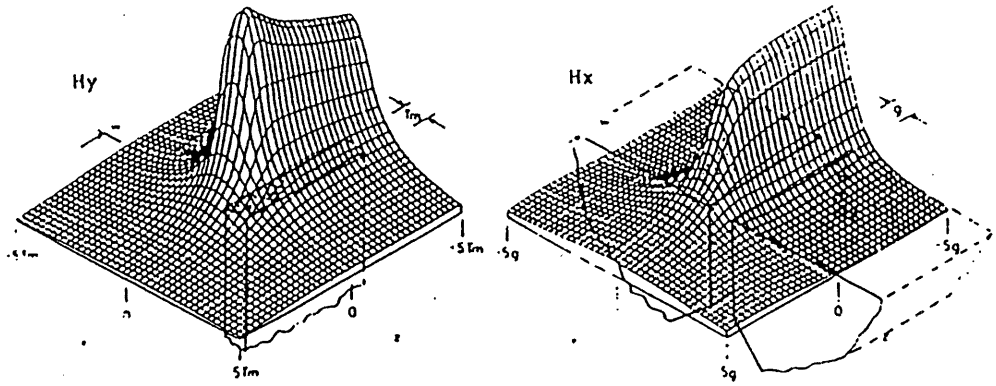
voltage per unit track width is improved by decreasing track width, because of reduction of the demagnetizing effect near the top surface of main pole, and hence the reproduction by the SPT head becomes possible with track width of 6.5μm.

Conclusions

The feasibility of high track density recording has been investigated, and it was proved that, with disregarding mechanical tracking consideration, no problems exist in decreasing the track width. Therefore, an increase of the track density as well as the linear density would become a powerful method in the development of a perpendicular magnetic recording system, in future.

Reference

1. S.Iwasaki, Y.Nakamura and H.Muraoka; IEEE Trans. Magn., MAG-17, 6, 2535 (1981).



Y=0.5 Tm, 0.5 g

near Side Edge of Head

(a) (b)

Fig.1 Field profiles of model head without medium;
(a) perpendicular field of SPT head,
(b) longitudinal field of ring type head.