Analysis of the Magnetic Field in High Density Pole Tip Head

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The recording density in magnetic recording system is represented by multiplying the bit density and track density. To increase the recording density, not only the magnitude of the magnetic field but also the field gradient of the recording head needs to be high. The magnitude of the head field at the gap recording region is needed to be high enough to overwrite the high coercive recording media, and together, magnetic field gradient of the write head is needed to be high enough to increase the linear density in the data track. In this paper, two steps to solve this problem is presented. The magnitude of the magnetic field is computed by the conventional 3D FEM, and then, field gradient of the write head in the gap region by using Laplacian.

In the recording region, the relative permeability is considered to be 1. So, the following Laplacian analysis could be applied to compute magnetic field gradient around the recording region. Magnetic field and field gradient of the longitudinal and perpendicular write head is computed. The width and length of the head foot is 80 nm x 80nm. Maximum field strength of the write head is about 7600 Oe in longitudinal head and 6900 Oe.

In this paper, magnetic field and field gradient in the region of the recording around the head gap could be obtained by Laplacian analysis based on the conventional FEM results. In the size 80 nm x 80 nm, 7600 Oe and 6900 Oe is achieved in the longitudinal and perpendicular head, respectively.

REFERENCES

[1]   W. P. Jayasekara, S. Khizroev, M. H. Kryder, W. Weresin, P. Kasiraj and J. Fleming, "Inducive Write Heads Using High Moment FeAlN Poles", IEEE Trans. on Magn., Vol. 35, No. 2, pp. 613 -618, 1999. 3.

[2]   Thomas Chang, "Modeling Assessment of Side Writing Properties of a Notch Write Head", IEEE Trans. on Magn., Vol. 33, No. 5", pp. 2842 -2843, 1997. 10.

[3]   S.X.Wang and P.R.Webb, "Modeling of Submicron Track Width Inductive Write Head Designs", IEEE Trans. on Magn., Vol. 31, No. 6, pp 2687 - 2689, November 1995.

[4]   Mark H.Kryder and Weng-Yew Lai, "Modeling of Narrow Tracks Thin Film Write Head Fields", IEEE Trans. on Magn., Vol. 30, No. 6, November 1994.

[5]   Kai-Zhong Gao an]H. Neal Bertram, "Write Field Analysis and Write Pole Design in Perpendicular Recording", IEEE Trans. on Mag, Vol.38, No. 5, pp3521 - 3527 September 2002