

## Off-track performances of perpendicular magnetic recording

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Perpendicular magnetic recording is now considered as a most promising technology to overcome the superparamagnetic limit of conventional longitudinal recording. Taking advantage of double-layered media with soft under layer, single-pole type (SPT) head shows improved field distribution and writability. Ultra-high resolution recording and thermal stability of disk drive seem to be achieved through perpendicular recording. However, as the pole tip of SPT head and soft underlayer of the media work as flux antenna, some off-track performances of perpendicular recording show different characteristics from longitudinal recording. These off-track characteristics should be considered carefully for high track density of disk drive. Off-track characteristics of SPT head are observed with varying the write current and skew angles. Field distribution of the write head and related magnetization of the media are investigated in the cross-track profile under various measuring conditions. Stray fields from the sides of the head are observed to be very sensitive to write current. Adjacent track interference is another recording characteristics that should be considered for high track density and also studied.

With experimental results, the correlations between write current and off-track characteristics of SPT head are discussed and write current optimization process in perpendicular recording is suggested.

The return pole of SPT head leads the flux from the media and improves the writability of SPT head. As increasing the flux density of pole-tip, the field from return pole may affect written bits. The return pole field effect on written bits is investigated and head field distribution is analyzed. In relation to the return pole effect, thermal stability that is usually considered as media characteristics is also discussed in terms of head field..

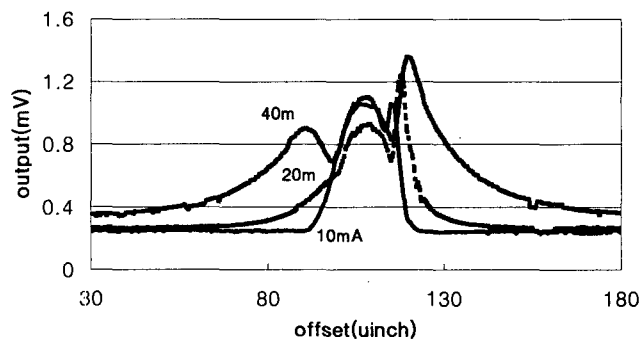


Fig.1. Output track profile for different write current  $I_w$  with skew angle  $3^\circ$