An experimental study of background interference impact on signal-to-noise ratio in heat assisted magnetic recording

Nuttapon Chaidaungsri[1], Somyot Kaitwanidvilai [1], Damrongsak Tongsomporn [2]

[1] Department of Electrical Engineering, KMITL, Bangkok 10520, Thailand

[2] Seagate Technology (Thailand), Teparuk, Mueang, Samutprakarn 10270 Thailand

In order to understand the areal density capability limits in heat assisted magnetic recording (HAMR) [1-2], we present an experimental results of the effects of pre-existing data impact on HAMR performance, which is called “background interference (BGI)”. The effects of BGI are measured by comparing a signal-to-noise ratio (SNR) of ac-erased and pseudorandom binary sequence background data with various background track pitch (TP) offset.

Basic technology demonstration of HAMR was explored using a spin-stand recording tester to provide recording head and media characteristic. Moreover, di-bit extraction technique have been employed in this investigation [3].

Figure 1 indicate that BGI or pre-existing data impact gives significant SNR loss relative to the ac-erased background. The trend of SNR decrease with increasing background offset for 40 to 100% TP, especially at 100% is 2.17 dB loss. Then, the SNR will become greater at 120% TP, where the edge of main and BGI tracks are far from each other. The primary cause of the on-track SNR degradation is due to the side-reading effect. As shown in figure 2, it is found that the BGI created the di-bit response with inversed polarity or undershoot echo. In summary, our research suggest that the background interference is a significant issue for an implementation of the HAMR technology as a product.

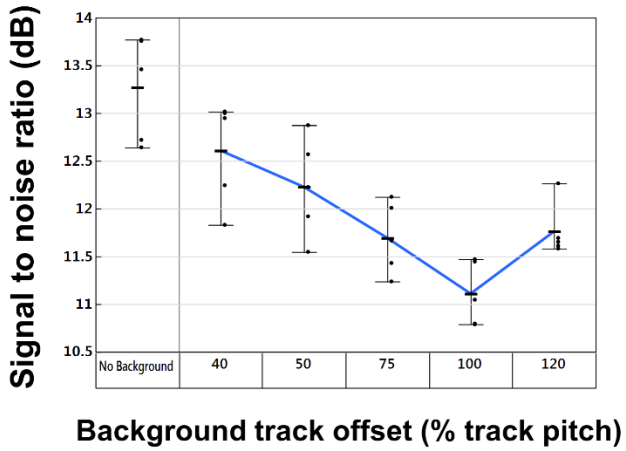

Figure 1. The effect of BGI impact on SNR with various track offset

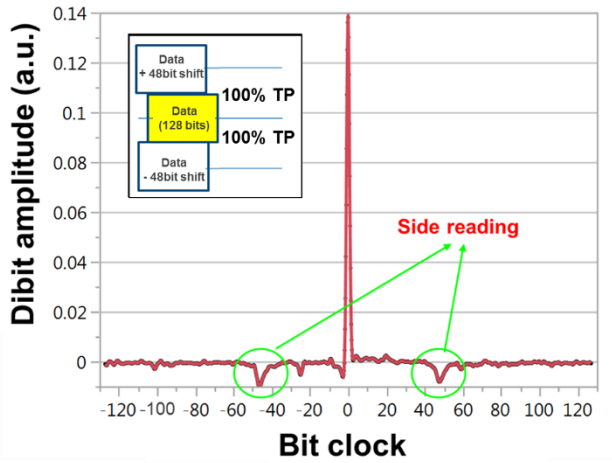

Figure 2. The undershoot echo of side reading evaluation.

[1] C.Rea et al., “Writer and Reader Head-to-Media Spacing Sensitivity Assessment in HAMR”, IEEE Trans. Magn., vol. 52, no. 2, pp.1-6, Feb.2016.
[2] C. Rea et al., "Areal-Density Limits for Heat-Assisted Magnetic Recording and Perpendicular Magnetic Recording," IEEE Trans. Magn., vol. 52, no. 7, pp. 1-4, July 2016.
[3] I. Ozgunes and W. R. Eppler, “Synchronization-free dibit response extraction from PRBS waveforms,” IEEE Trans. Magn., vol. 39, no. 5, pp. 2225–2227, Sep. 2003.