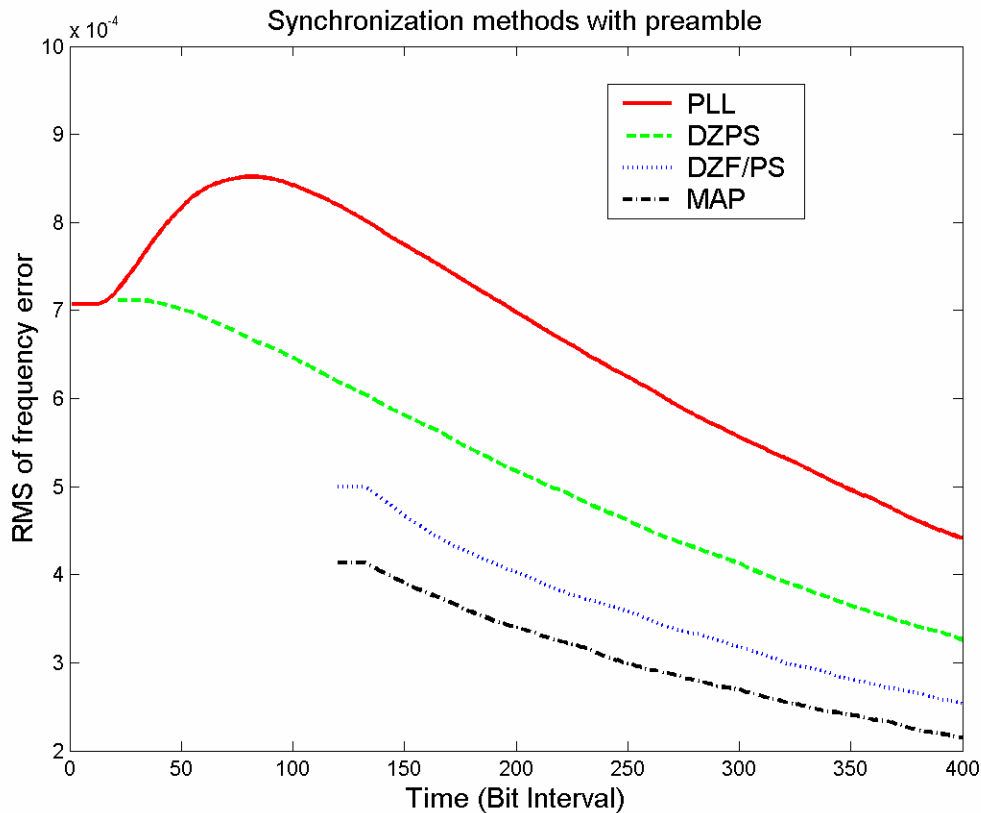


## TIMING RECOVERY FOR DATA STORAGE SYSTEMS

Future data storage systems such as hard disk drives, tape recording systems, blu-ray disks must cope with decreased signal-to-noise ratios (SNRs) and increased intersymbol interference (ISI). One method to achieve acceptable bit error rates in the presence of these problems is to use advanced coding and signal processing methods such as turbo codes and low density parity check (LDPC) codes. However, such digital channels require that the readback analog signal be sampled at optimal time instants. Poor synchronization causes bit errors. Even worse, the sampler may miss a bit (cycle slip), leading to the loss of the whole block. Each block has preamble at the start and the preamble is a known pattern. We are developing algorithms that make better use of the preamble.



This figure shows the root mean square (RMS) frequency error as a function of time for four different timing recovery systems: the conventional phase locked loop (PLL) system, digital zero phase start (DZPS), digital zero frequency/phase start (DZF/PS) and the maximum a posteriori (MAP).