This paper presents a new scheme to encode the position information in hard disk drive. The read-back amplitudes of servo bursts, which are placed sequentially along the circular tracks (down-track direction), are used to find the displacement between the head and the centre of the track. Each of these bursts consists of equidistant, parallel magnetic transitions, forming a specific offset pattern in radial direction (cross-track) of the disk. The read-back signal from each servo burst contains pulses at same frequency. The demodulator finds the magnitude of read-back pulses for each burst, and estimates the position error signal (PES) from there. Since all the bursts use same magnetic transition pattern, they must be separated in the down-track direction. This leaves empty spaces between patterns, increasing the servo overhead or the percentage of storage area used for servo information. The proposed servo pattern use different frequency for the two servo-bursts, making it possible to place them at the same down-track location. The demodulator extracts the amplitude of each of these frequency components in the read-back signal, which is then used for PES calculation.

The servo control system in a hard disk drive (HDD) maintains the read/write head over a track with minimum deviation from the centre of the track. The feedback signal for this position control servomechanism is extracted from the servo information recorded onto the disk surface. The servo information comprises a position-encoded pattern of magnetic transitions, generally flux reversals, that are pre-recorded in the servo tracks. The transitions are typically recorded as parallel radial stripes. When the read/write head passes over these transitions, the head generates an analog signal whose repeating cyclic variations can be decoded to indicate the position of the head over the track. The decoded or demodulated servo signal is known as PES.

Modern HDDs using embedded servo have their servo information interleaved with data sectors. The servo data consist of reference for Automatic Gain Control (AGC) circuit, grey coded track number, and servo bursts used to generate PES. In the past, analog methods used to be the only method for decoding the PES from the servo bursts. After introduction of partial response maximum likelihood (PRML) method for read/write channels, digital signal processing has gained increasing attention from servo engineers as a tool for detecting PES. The advantage of digital processing lies with the capability of implementing advanced, sophisticated algorithms to reduce the position sensing noise that gets into the servo channel. The DSP algorithms also allow deviation from the conventional servo encoding schemes, which would not be otherwise possible with analog servo detection methods. This flexibility has inspired the search for new encoding schemes.

Conventional servo patterns occupy 8% to 10% of a track. Almost half of this space is consumed by the quadrature servo bursts, the pattern that encodes off-track error. This paper presents a burst pattern requiring less storage space and, therefore, reducing servo overhead. Sensitivity and linearity of PES are verified using simulation and experimental results.