

# New cyclic prefix based symbol timing and carrier synchronization for OFDM

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**Abstract:** Symbol timing and carrier frequency synchronization are crucial to OFDM systems. One of the blind synchronization methods is the cyclic prefix (CP) based maximum likelihood (ML) symbol timing and carrier frequency synchronization which correlates the cyclic prefix and the last part of the OFDM symbol. However, the performance of this method is seriously reduced in the time-variant multipath channel. In this paper, we propose a new CP which has two parts. One part is a copy of the head of the last symbol and the other part is a copy of the tail of that symbol. Both parts have the length of half of the CP. As a result of this new CP, the starting time of one OFDM symbol is allowed to fall into its effective period (the absolute value of the symbol timing error should be smaller than  $CP/2$ ). The performance of OFDM systems is improved significantly with this new CP. ?? 2006 IEEE.

**Index Keywords:** Communication channels (information theory); Error analysis; Maximum likelihood estimation; Synchronization; Cyclic prefix (CP); Frequency synchronization; Time variant multipath channel; Orthogonal frequency division multiplexing

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