

# Abstract

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## **Novel Time and Frequency Synchronization Techniques for OFDM Systems in Double Selective Fading Channel**

OFDM receiver performance is affected by the time offset and the carrier frequency offset, as these two parameters have severe effect on the signal reception quality. In this paper, two novel schemes for time estimation (TE) and frequency estimation (FE) are proposed to overcome the time and carrier frequency offset problem, and therefore improve the performance of the OFDM reception. The proposed techniques are based on the fact that, using the correlation of constant amplitude zero auto correlation sequence with a unity peak to average power ratio gives a sharp time metric peak. The proposed timing symbol based on this fact introduces a TE technique that has a sharp peak at the correct time instant and no side lobes. In addition, the proposed FE technique is based on the same training symbol and it takes place in two steps. The first step is the fine FE technique, which depends on calculating the phase difference between the cyclic prefix and the preamble tail. It is referred to as fractional FE. The second step is the coarse offset FE and it is referred to as integer FE. The coarse offset FE is based on FFT and it has less mean square error than other methods.