Abstract

Wavelet Packet based Multi-Carrier Modulation (WPM) offers an alternative to the well-established Orthogonal Frequency Division Multiplexing (OFDM) as an efficient multicarrier modulation technique. It has strong advantage of being generic transmission scheme whose actual characteristics can be widely customized to fulfill several requirements and constraints of advanced communication systems. In the last decades wavelets have been favorably applied in signal and image processing fields but they just recently attracted attention of the telecommunication community. Therefore, some research questions remain to be addressed before novel WPM can be used in practice. One of the major concerns involves the performance of WPM transceivers under various synchronization errors. In this thesis we analyze the interference in WPM transmission caused by the carrier frequency offset and time synchronization errors. Using standard wavelets, the sensitivity of WPM transceivers to these errors is evaluated through simulation studies and their performances are compared and contrasted to OFDM. To alleviate the WPM's vulnerability to time synchronization errors, a method of synchronization is proposed. The proposed time synchronization method in WPM is based on already published feed-forward decision-directed approach which uses correlation method in the wavelet domain (after processed by the analysis filter bank in the receiver side), with lower implementation complexity and improved stability. The proposed method can be considered as "coarse" time synchronization, suitable for estimating large time offset but with less precision. Through computer simulations the performance of the proposed method is proven and further its performance is compared for different parameters of wavelet filters.