

ABSTRACT

OFDM (Orthogonal Frequency Division Multiplexing) is one of multicarrier modulation technology which supports high transfer rate by using bandwidth efficiently. Therefore, many of world standardization adopt this technology, such as DVB from European Telecommunication Standard Institute (ETSI), WiFi and WiMAX from Institute of Electrical and Electronics Engineers (IEEE), and LTE from Third Generation Partnership Project (3GPP). However, OFDM technology has some disadvantages as well, one of them is Intercarrier Interference (ICI). ICI occurs when a subcarrier suffers interference caused by another subcarriers in receiver. It happens when there is carrier frequency offset (CFO) or frequency offset between transmitter and receiver. Moreover, for High-Mobility communication will suffer worse because of Doppler shift. Doppler shift takes place only for high mobility users and causes CFO which impact impairment of orthogonality among subcarriers, and of course degrades the OFDM performance.

This research uses Extended Kalman Filter (EKF) as scheme of ICI reduction by deploying CFO estimation and commit correction using iteration beforehand. This method requires preamble in the beginning of frame for early estimation purpose prior to send information. This method works optimally in slow time varying channel, where the value of CFO is considered constant in one frame.

Result of simulation shows that OFDM using EKF scheme is better than conventional OFDM. OFDM using EKF is able to achieve Bit Error rate (BER) approximately 10^{-5} by providing E_b/N_0 equal to 14 dB, whereas conventional OFDM could only achieve an equal BER by providing E_b/N_0 equal to 16 dB. It means OFDM using EKF is able to correct 2 dB of system gain for each 10^5 generated bit by conventional OFDM. Besides, EKF scheme is also creating a reliable performance in any user's velocity for mobile users and in any mapper.

Keywords: OFDM, ICI, EKF, BER, CFO