

Space-time and space-frequency OFDM with convolutional precoding over fading channels

ABSTRACT

Transmit diversity in orthogonal frequency division multiplexing (OFDM) has gained a lot of interest recently due to its ability to transform frequency selective fading into multiple flat fadings. In this paper we investigate 2 transmit and 1 receive (2Tx:1Rx) space-time OFDM (ST-OFDM) and space-frequency OFDM (SF-OFDM) systems in conjunction with convolutional precoding as a redundancy method to combat channel impairments. We built our ST and SF-OFDM on top of our coded OFDM (COFDM) with convolutional coding of rate 1/4 and constraint length of 10. We simulated our ST-OFDM and SF-OFDM over a multipath fading channel using Naftali 802.11 channel model under various delay spreads in relation to outdoor environment. SF-OFDM show a slight performance improvement under these conditions as compared to ST-OFDM by as much as 3 dB signal to noise ratio (SNR) requirement for the same BER of 10^{-4} for a delay spread of 1.5 microseconds. We also compare our precoded ST-OFDM and SF-OFDM against conventional single carrier OFDM and COFDM systems as well as Alamoutis space time block code (STBC) system.

Keyword: OFDM; Transmit diversity; Fading channels; Space-time; Space-frequency; Convolutional coding