Performanc Simulation of DS-CDMA and OFDM Combined in Radio Fading Channel

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ABSTRACT

A DS-CDMA-OFDM system, which is a combination of DS-CDMA and OFDM technologies, is proposed to reduce the effect of Inter-symbol interference (ISI) caused by frequency selective fading radio channel and Multi-access interference (MAI). The energy efficiency of proposed system is investigated based on simulation, and the results is compared with a pure DS-CDMA having a RAKE receiver. In the proposed DS-CDMA-OFDM system, the message is spread by a spreading code, and follows by OFDM modulation. To keep the bandwidth of the OFDM sub-carrier smaller than the channel coherence bandwidth in high data transmission rate, the number of the OFDM sub-carriers must be greater than the spreading factor (SF). From the simulation results, for single user situation, we find that the energy efficiency of DS-CDMA-OFDM is approximately the same as the pure DS-CDMA system with RAKE receivers. For the multiple-user situation, the performance of the DS-CDMA-OFDM system is better than the pure DS-CDMA system irrespective of the spread factor. In a BER of 10-2 and an SF of 32, the energy efficiency of the DS-CDMA-OFDM system is at least 3 dB better than that of the pure DS-CDMA system, while at least 5.4 dB better for a BER of 10-3 and an SF of 64. We find that the MAI rejection capability of the DS-CDMA-OFDM system is proportional to the spread factor. In general, the proposed DS-CDMA-OFDM system is not only able to reduce the effect of ISI ability, but also to reject the MAI.

Keywords : OFDM、DS-CDMA、RAKE receiver、ISI、MAI

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