

Two dimensional signal spreading in UMTS LTE: exploiting time-frequency diversity to increase throughput

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Abstract:

This paper proposes a two-dimensional spreading method in UMTS Long Term Evolution (LTE). Such method brings additional time-frequency diversity which is beneficial in terms of the ability to decode transmitted data at the receiver side under multipath fading. Additional diversity is caused by the fact that chips of transmitted signals are spread with a Walsh-Hadamard spreading sequence over several subcarriers as well as over several time-slots simultaneously.

A comparison with state-of-the-art LTE downlink transmission is provided. To enable reproducibility and to increase credibility of our results, open source Vienna LTE simulator is utilized. LTE transmissions with the proposed 2D spreading are tested on several channel models. Simulations show that apart from an Additive White Gaussian Noise (AWGN) channel model, the 2D spreading based method outperforms the throughput performance of standard LTE. At high Signal to Noise Ratio (SNR), the throughput increase in most channel models is higher than 10%.