MIMO Gain and Energy Efficiency in LTE

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Abstract:

Current 3GPP specifications for LTE include the use of MIMO as a key technology. MIMO can be seen from two different perspectives: if increased data rates are targeted, for a given value of SNR, one gets improved data transmission; however, from an energy efficiency viewpoint, lower values of SNR are needed for the same reference data rate, therefore, allowing the reduction of the transmitted power, while providing the same data rate as the one for SISO. In this paper, a framework for evaluating the possible benefit of using MIMO instead of SISO, from the expected SNR improvement viewpoint is proposed, and results for different environments are presented and discussed. The proposed evaluation methodology all ows one to properly assess the expected benefits of MIMO, therefore, providing guidelines to enable a proper SISO/MIMO mode selection according to the required service data rate. The analysis being presented is based on existing 3GPP models for data rate versus SNR in LTE. Simulation results for the ETU70 3GPP channel model are provided. It is observed that, for given reference data rates, significant SNR improvements can be obtained. Maximum values of 7.1, 15.7 and 18.0 dB SNR reduction are obtained for 2x2, 4x4 and 8x8 MIMO configurations, compared to the SISO case, therefore, allowing a significant reduction of the transmitted power, while providing the same target data rate as the one for SISO.