

Throughput of low-power cellular systems with collaboration at base stations and mobile terminals

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In this paper, joint (cooperative) decoding at the base stations combined with collaborative transmission at the mobile terminals is investigated as a means to improve the uplink throughput of current cellular systems over fading channels. Intra-cell orthogonal medium access control (e.g., TDMA, FDMA or orthogonal CDMA) and Decode-and-Forward collaborative transmission among terminals are assumed. Moreover, the cellular system is modelled according to a simplified framework introduced by Wyner. The focus of this work is on low-power transmission (or equivalently on the wideband regime), where the ergodic per-cell throughput can be described by the minimum energy per bit required for reliable communication and the slope of the spectral efficiency at low SNR. These two parameters are derived for different system configurations and, capitalizing on the analysis, the relative merits of both cooperation among base stations and among terminals are clearly assessed.