Energy-Efficient Resource Allocation in OFDM Systems With Distributed Antennas

In this paper, we develop an energy-efficient resource-allocation scheme with proportional fairness for downlink multiuser orthogonal frequency-division multiplexing (OFDM) systems with distributed antennas. Our aim is to maximize energy efficiency (EE) under the constraints of the overall transmit power of each remote access unit (RAU), proportional fairness data rates, and bit error rates (BERs). Because of the nonconvex nature of the optimization problem, obtaining the optimal solution is extremely computationally complex. Therefore, we develop a low-complexity suboptimal algorithm, which separates subcarrier allocation and power allocation. For the low-complexity algorithm, we first allocate subcarriers by assuming equal power distribution. Then, by exploiting the properties of fractional programming, we transform the nonconvex optimization problem in fractional form into an equivalent optimization problem in subtractive form, which includes a tractable solution. Next, an optimal energy-efficient power-allocation algorithm is developed to maximize EE while maintaining proportional fairness. Through computer simulation, we demonstrate the effectiveness of the proposed low-complexity algorithm and illustrate the fundamental tradeoff between energy- and spectral-efficient transmission designs.