Designing Energy-Efficient Wireless Access Networks: LTE and LTE-Advanced

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Abstract:

As base stations are currently large energy consumers, it is important to investigate their energy-efficiency to develop more energy-efficient wireless access networks in the future. This study investigates how energy-efficient LTE-Advanced networks can be designed compared to LTE networks. Therefore, a power consumption model is developed for LTE and LTE-Advanced macrocell and femtocell base stations, along with a suitable energy efficiency measure. The influence on the energy efficiency of three main functionalities added to LTE-Advanced is investigated: carrier aggregation, heterogeneous networks, and extended MIMO support. Our study shows that the energy efficiency can be improved up to 400% and 450% by using respectively, carrier aggregation and MIMO. For bit rates higher than 20 Mbps, the macrocell base station is the most energy-efficient. Below 20 Mbps, it depends on the bit rate.