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Micro Base Station Aided Failover for Multicast Scheduling in Wireless Cellular Networks

ABSTRACT:

We consider scheduling mechanisms for downlink multicasting of critical messages across cellular wireless systems. We study the robustness of such schemes following the failure of a macro base station (MBS) node. We determine whether the additional deployment of micro base station (mBS) nodes can enhance the system's performance. We assume MBS and mBS nodes to coordinate their multicast transmissions by using TDMA or FDMA (rather than an MBSFN-based) adaptive rate and power scheduling algorithms. Neighboring mBS and MBS nodes coordinate their operations to optimally configure their transmission schedules and spectral and/or temporal resources and transmit code rate and power levels. We show that, under low intersite distance (ISD) values, each identifying the distance between neighboring MBS nodes, the use of deployed mBS nodes does not enhance the system's attainable multicast spectral efficiency. Under intermediate ISD levels, the deployment of a backup mBS node that is located near the MBS node limits the post-failure degradation of throughput capacity rate to less than 10%. In turn, under longer ISD range levels, the combined use of a backup mBS and of neighboring mBS nodes, which adjust their code rate levels to reach mobiles located in the failed cell, leads to significant performance improvement.