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Abstract:
Heterogeneous cellular networks (HetNets) - conventional macro base stations overlaid with low-power nodes-are being deployed for reasons of improved spectral efficiency, economy, and scalable network expansion. To optimally realize the benefits of HetNets, it is crucial to factor deployment aspects such as cell association, transmission power, spectrum allocation, and deployment density. This paper presents comprehensive dynamic system level simulations based on the 3GPP Long Term Evolution (LTE) standard modeling spatial, temporal, and frequency domain channel variations and ray-tracing based penetration losses in urban and indoor environments. The simulator takes into account the dynamic (subframe level) modulation and coding scheme and precoder selection, as well as finite rate channel state feedback and transmission aspects intrinsic to LTE. Considering a Rel. 8/9 LTE HetNet, two access schemes are analyzed: first, open access picocells, where results show that a single picocell can double the area spectral efficiency without any impairment of the macro-layer, and second, closed access femtocells, where results show that in typical scenarios, the user throughput is deteriorated on both the macro-layer and the femto-layer. Consequently, open access low-power nodes can be deployed as is, whilst closed access ones require additional interference avoidance mechanisms. These dynamic system level simulations are important for deriving accurate and practically relevant performance trade-offs, while commensurate with the time and frequency granularity of LTE.

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ASUS EX2057-p.1
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I Introduction

Over the last decade, vast increases in the data throughput of wireless cellular networks have been achieved, mainly through advancements to the air interface. The 3rd Generation Partnership Project's (3GPP's) Long Term Evolution (LTE) features orthogonal frequency-division multiplexing (OFDM) and multiple input multiple output (MIMO) techniques as examples for the aforementioned enhancements. Recently, however, it has become increasingly difficult to keep up with the data demand novel devices impose on these networks. Multi-user MIMO (MU-MIMO) techniques, for instance, substantially increase the complexity of the scheduler at the base stations, especially at high bandwidths, where up to 100 resource blocks have to be assigned to possibly hundreds of users on a millisecond-by-millisecond basis. Accordingly, standardization bodies have begun to consider upgrades to the infrastructure in support of improvements to the air interface. Coordinated multi-point (CoMP) transmissions by means of base station cooperation are one promising example considered for LTE-Advanced. CoMP lets base stations coordinate their transmissions in order to reduce the impact of intercell interference to out- of-cell users. In this paper, we focus on the deployment of heterogeneous networks (HetNets) as yet another means.

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