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TAIL ASYMPTOTICS OF SIGNAL-TO-INTERFERENCE RATIO DISTRIBUTION IN SPATIAL CELLULAR NETWORK MODELS

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Abstract: We consider a spatial stochastic model of wireless cellular networks, where the base stations (BSs) are deployed according to a simple and stationary point process on $\mathbb{R}^d$, $d \geqslant 2$. In this model, we investigate tail asymptotics of the distribution of signal-to-interference ratio (SIR), which is a key quantity in wireless communications. In the case where the path-loss function representing signal attenuation is unbounded at the origin, we derive the exact tail asymptotics of the SIR distribution under an appropriate sufficient condition. While we show that widely-used models based on a Poisson point process and on a determinantal point process meet the sufficient condition, we also give a counterexample violating it. In the case of bounded path-loss functions, we derive a logarithmically asymptotic upper bound on the SIR tail distribution for the Poisson-based and α-Ginibre-based models. A logarithmically asymptotic lower bound with the same order as the upper bound is also obtained for the Poisson-based model.

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