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 \( \mathbb{R}^d, d \geq 2 \). 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 \( \alpha \)-Ginibre-based models. A logarithmically asymptotic lower bound with the same order as the upper bound is also obtained for the Poisson-based model.

2010 AMS Mathematics Subject Classification: Primary: 60G55; Secondary: 90B18.

Keywords and phrases: Spatial point processes, cellular networks, tail asymptotics, signal-to-interference ratio, determinantal point processes.