

# Seeking Foschini's Genie: Optimal Rates and Powers in Wireless Networks

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- [foschini\\_genie.pdf](#)

An adaptive rate and power control approach is presented in this paper. The approach is layered, with a rate optimization algorithm selecting the optimal rates for the system and a power control algorithm subsequently calculating the associated powers. The approach adapts to changes in demands on the system such as the arrival or departure of users, changes in the rate thresholds expected by users, and changes in the mix of traffic presented to the system. Basic properties and performance limits are established within the mathematical framework of Perron Frobenius matrix theory. The right and left eigenvectors of a matrix associated with the network are found to describe the optimal performance of each link in the system. Leveraging this analysis, a method is described that seeks optimal rates. A simulation demonstrates the performance gain associated with this approach.

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