On Certain Large Random Hermitian Jacobi Matrices with Applications to Wireless Communications

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Abstract

In this paper we study the spectrum of certain large random Hermitian *Jacobi* matrices. These matrices are known to describe certain communication setups. In particular we are interested in an uplink cellular channel which models mobile users experiencing a soft-handoff situation under joint multicell decoding. Considering rather general fading statistics we provide a closed form expression for the per-cell sum-rate of this channel in high-SNR, when an intra-cell TDMA protocol is employed. Since the matrices of interest are *tridiagonal*, their eigenvectors can be considered as sequences with second order linear recurrence. Therefore, the problem is reduced to the study of the exponential growth of products of two by two matrices. For the case where K users are simultaneously active in each cell, we obtain a series of lower and upper bound on the high-SNR power offset of the per-cell sum-rate, which are considerably tighter than previously known bounds.