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Monte Carlo studies of the emergent spacetime in the polarized IKKT model

The IKKT matrix model has been investigated as a promising nonperturbative formulation of superstring theory. One of the recent developments concerning this model is the discovery of the dual supergravity solution corresponding to the model obtained after supersymmetry-preserving mass deformation, which is dubbed the polarized IKKT model. Here we perform Monte Carlo simulations of this model in the case of matrix size N = 2 for a wide range of the deformation parameter Omega. While we reproduce precisely the known result for the partition function obtained by the localization method developed for supersymmetric theories, we also calculate the observables, which were not accessible by previous work, in order to probe the spacetime structure emergent from the dominant matrix configurations. In particular, we find that the saddle point corresponding to the original IKKT model is smoothly connected to the saddle represented by the fuzzy sphere dominant at large Omega, whereas the dominant configurations become diverging commuting matrices at small Omega.

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