

# The phase diagram of the bosonic Lorentzian IKKT matrix model with the mass term

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The IKKT matrix model was proposed in 1996 as a non-perturbative description of superstring theory. One of its appealing features is the fact that spacetime emerges naturally from first principles as the eigenvalue distribution of the bosonic matrix degrees of freedom. For the past few decades, there has been extensive number of numerical attempts to study the model. In this work, we investigate the bosonic Lorentzian IKKT model with the addition of the mass term to regularize the path integral. We first exhaust all the classical solutions at  $N=2$  and find that there are non-trivial solutions representing lower-dimensional spacetimes. By performing the perturbative expansions and computing the partition functions associated with the solutions, we can obtain a phase diagram of the theory. We also discuss the possibility of the emergence of the real spacetime.

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