ICTS Seminar

Title : Complex Langevin analysis of the spontaneous symmetry breaking in dimensionally reduced super Yang-Mills models

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Time : 11:00 AM

Venue : Emmy Noether Seminar Room, ICTS Campus, Bangalore

Abstract : In recent years the complex Langevin method (CLM) has proven a powerful method in studying statistical systems which suffer from the sign problem. Here we show that it can also be applied to an important problem concerning why we live in four-dimensional spacetime. Our target system is the type IIB matrix model, which is conjectured to be a nonperturbative definition of type IIB superstring theory in ten dimensions. The fermion determinant of the model becomes complex upon Euclideanization, which causes a severe sign problem in its Monte Carlo studies. It is speculated that the phase of the fermion determinant actually induces the spontaneous breaking of the SO(10) rotational symmetry, which has direct consequences on the aforementioned question. In this paper, we apply the CLM to the 6D version of the type IIB matrix model and show clear evidence that the SO(6) symmetry is broken down to SO(3). Our results are consistent with those obtained previously by the Gaussian expansion method.