ID contributo: **112**

Tipo: **Poster session**

Topological properties of CP^{N-1} models

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The study of non-perturbative properties characterizing Quantum Chromo-Dynamics (QCD) is of relevant theoretical and phenomenological interest. Indeed, the θ-dependence of QCD is related to open issues such as the strong-CP violation or to the Peccei-Quinn axion physical properties.
The lattice approach is a natural first-principle tool to investigate the non-perturbative properties of gauge theories and it has proven to be very successful in the study of the topological properties of QCD. For this reason, in the literature there are many numerical works dedicated to the study of simpler toy models as a test-bed for new algorithms and numerical methods for the study of gauge theories.
An example is provided by the $2d$ CP^{N-1} models, which share many properties with QCD, such as asymptotic freedom, confinement, instantons and θ-dependence. A peculiarity of the CP^{N-1} models emerges in the $N \to 2$ limit. In the case of CP^1, which can be exactly mapped into the $O(3)$ σ-model, the semi-classical picture predicts the divergence of the topological susceptibility, due to the dominance of instantons of arbitrarily small size. Detecting this divergence by numerical lattice simulations is not an easy task, because it is logarithmic in the lattice spacing.
We address the problem from a new original perspective: we study the behavior of the model when the volume is fixed in dimensionless lattice units, where perturbative predictions are turned into more easily checkable behaviors. After testing this strategy for $N = 3$ and 4, we apply it to $N = 2$, adopting at the same time a multicanonic algorithm to overcome the problem of rare topological fluctuations on asymptotically small lattices. Our final results fully confirm, by means of purely non-perturbative methods, the divergence of the topological susceptibility of the $2d$ CP^1 model.

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Classifica Sessioni: Poster Session and Discussion Session