Contribution ID: **120** Type: **Parallel Talk**

Non-equilibrium dynamics of topological defects in the 3D O(2) model

Thursday, 3 August 2023 17:00 (20 minutes)

We present a study of the 3D O(2) non-linear σ-model on the lattice, which manifests topological defects in the form of vortices. They tend to organize into vortex lines that bear strong analogies with global cosmic strings. Therefore, this model serves as a testbed for studying topological defects. Moreover, the model undergoes a second-order phase transition, hence it is appropriate for investigating the Kibble-Zurek mechanism for cosmic strings. We examine the persistence of topological defects as the temperature is rapidly reduced from above to below the critical temperature, leading to a cooling process that takes the system out of equilibrium. We explore a wide range of inverse cooling rates (τ_Q) and temperatures, employing several Monte Carlo algorithms. The results consistently show that the density of remaining topological defects follows a power-law in τ_Q, aligning with Zurek's proposal. However, we differ from Zurek's prediction for the exponent in this power-law.

Topical area

Theoretical Developments

Primary authors: Dr POLANCO EÚAN, Elías Natanael (Instituto de Ciencias Nucleares, UNAM); LÓPEZ--CONTRERAS, Edgar (Instituto de Ciencias Nucleares, UNAM); NIETO CASTELLANOS, Jaime Fabián (Nuclear Sciences Institute, UNAM); Dr BIETENHOLZ, Wolfgang (Instituto de Ciencias Nucleares, UNAM)

Presenter: LÓPEZ-CONTRERAS, Edgar (Instituto de Ciencias Nucleares, UNAM)

Session Classification: Theoretical Developments