

U(1) vacuum, Chern-Simons diffusion and real-time simulations

Monday, July 23, 2018 3:00 PM (20 minutes)

Non-abelian gauge theories have a complex vacuum structure which has well-known dynamical consequences. The prototypical example is given by $SU(2)$ sphalerons and their potential role in baryogenesis. Transitions between topologically inequivalent vacua can produce some irreversible net amount of chiral charge.

At a first glance, it does not seem that similar effects may be obtained with Abelian fields as they have a topologically non-degenerate vacuum. Looking more closely, one may realise that the addition of a background magnetic field changes the picture.

The aim of this talk is to present an investigation of such systems based on real-time simulations. In particular, we will give some context by presenting the numerical set up, before discussing results on the U(1) Chern-Simons diffusion rate in a constant magnetic background. We will also discuss the evolution of the chiral chemical potential.

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Session Classification: Applications beyond QCD

Track Classification: Applications Beyond QCD