

Vortex reconnection in critical 3D Abelian Higgs models

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The critical Abelian Higgs model (AHM) is a system of nonlinear wave equations arising in particle physics. We construct solutions of this system in $3+1$ dimensions that exhibit a number of slowly-moving nearly parallel vortex filaments. The leading-order dynamics of this ensemble of filaments are described by a wave map into the moduli space, a manifold carrying a natural Riemannian structure that parametrizes stationary 2D solutions of the AHM. These results allow for the study of the poorly-understood phenomenon of vortex reconnection in this setting. In particular, it is shown that in the regime studied, reconnection is the generic outcome of collisions of pairs of vortex filaments. Extremely similar results are also proved for the critical Abelian Higgs heat flow, modeling certain superconductors, and in higher dimensions. This work is joint with Amirmasoud Geevechi

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