

Vortex mass in the three-dimensional $O(2)$ scalar theory

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We study the spontaneously broken phase of the XY model in three dimensions, with boundary conditions enforcing the presence of a vortex line. Comparing field theoretical and Monte Carlo determinations of the magnetization profile, we numerically determine the mass of the vortex particle in the underlying $O(2)$ -invariant quantum field theory. The result also shows that Derrick's theorem does not in general pose an obstruction to the existence of stable topological particles in scalar quantum field theories in more than two dimensions.

References:

- [1] G. Delfino, W. Selke and A. Squarcini, Phys. Rev. Lett. 122, 050602 (2019).
- [2] G. Delfino, J. Phys. A: Math. Theor. 47 (2014) 132001.

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