

It has been shown in [1] that the quantum field theory associated to the three-dimensional XY model, which encodes the universal properties of the superfluid transition, possesses a vortex topological particle. This also shows that the obstruction to the existence of topological particles posed at the classical level by Derrick's theorem does not in general persist in the quantum theory. The result is an application of the more general theory formulated in [2].

[1] G. Delfino, W. Selke and A. Squarcini,
Vortex mass in the three-dimensional $O(2)$ scalar theory,
Phys. Rev. Lett. 122, 050602 (2019),
DOI: 10.1103/PhysRevLett.122.050602

[2] Gesualdo Delfino,
Order parameter profiles in presence of topological defect lines,
J. Phys. A 47 (2014) 132001,
DOI: 10.1088/1751-8113/47/13/132001