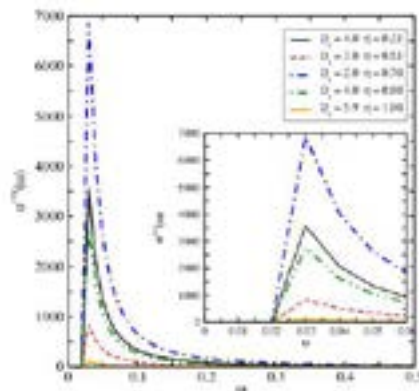


3rd International Conference on **Nuclear and Plasma Physics**
&
4th International Conference on **Quantum Physics and Quantum Technology**
November 05-06, 2018 | London, UK

Meissner mechanism for the spin supercurrent and influence of the critical behavior on spin transport in the frustrated Heisenberg model

Leonardo S Lima
CEFET-MG, Brazil

The local spontaneous symmetry breaking is a general phenomena in condensed matter physics. It is characterized by the fact that the action has a local symmetry but the quantum theory instead of having a unique vacuum state which respects this symmetry, has a family of degenerate vacua that transform into each other under the action of the symmetry group. A simple example is given by a ferromagnetic model in which the action governing its microscopic dynamics is invariant under spatial rotations. A kind of local gauge invariance or spontaneous breaking of U(1) gauge symmetry is realized in nature in the phenomenon of superconductivity. We have proposed the Meissner mechanism for the spin supercurrent in quantum spin systems. Besides, we study the behavior of the AC spin conductivity in neighbourhood of quantum phase transition in a frustrated spin model such as the antiferromagnet in the union jack lattice with single ion anisotropy at $T=0$. We investigate the spin conductivity for this model that presents exchange interactions J_1 and J_2 . Our results show a single peak for the conductivity with the height varying with the behavior of critical anisotropy D_c with J_2 . We obtain the conductivity tending to zero in the limit 0.



Behavior of AC spin conductivity for different values of J_2 coupling and D_c . The peak in the spin conductivity suffers a sudden variation in the cuspid point of the graphic D_c vs. J_2 parameter of Ref. [1]. Furthermore, we get the AC conductivity tending to zero at limit $w = 0$.

Recent Publications

1. L S Lima (2016) Influence of quantum phase transition on spin conductivity in the anisotropic three-dimensional ferromagnetic model. *Solid State Commun.* 250C:49.
2. L S Lima A S T Pires and B V Costa (2015) Critical behaviour of the site diluted quantum anisotropic Heisenberg model in two dimensions. *Physica A: Statistical Mechanics and its Applications.* 438(C):579-585.
3. L S Lima (2017) Spin transport of the frustrated quasi-two dimensional XY-like antiferromagnet. *J. Magn. Magn. Mater.* 422(C):412.
4. L S Lima (2018) Spin current and effect of quantum phase transition in the two-dimensional XY model. *Physica C: Superconductivity and its applications.* 547:22-26.

Biography

Leonardo S Lima pursued his PhD from Federal University of Minas Gerais, Brazil; Postdoctoral studies from TU Kaiserslautern, Germany. He is the currently Professor of Physics in the Department of Physics and Mathematics at the Federal Center for Technological Education of Minas Gerais (CEFET-MG). He has more than 50 papers published in international journal and indexed.

slima7@yahoo.com.br