



Universidade Federal da Paraíba
Centro de Ciências Exatas e da Natureza
Programa de Pós-Graduação *Stricto Sensu* em Física

Colóquio

“Casimir Energy for a Coupled Fermion-Soliton System in $(1+1)$ dimensions”

RESUMO: We consider a fermion chirally coupled to a prescribed pseudoscalar field in the form of the soliton of the sine-Gordon model and calculate the Casimir energy and all the relevant quantities for each parity channel, separately. We use a simple prescription to construct the simultaneous eigenstates of the Hamiltonian and parity in the continua from the scattering states. We also use a prescription to calculate unique expressions for the phase shifts and check their consistency with both the weak and strong forms of the Levinson theorem. In the graphs of the total and parity decomposed Casimir energies as a function of the parameters of the pseudoscalar field distinctive deformations appear whenever a fermionic bound state energy level with definite parity crosses the line of zero energy. However, the latter graphs reveal some properties of the system which cannot be seen from the graph of the total Casimir energy. Finally we consider a system consisting of a valence fermion in the ground state and find that the most energetically favorable configuration is the one with a soliton of winding number one, and this conclusion does not hold for each parity, separately.

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