Seminario de análisis matemático y aplicaciones
Analisi matematikoa eta aplikazioak mintegia

A variational study of some hadron bag models.

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ABSTRACT: Quantum chromodynamics (QCD) is the theory of strong interaction and accounts for the internal structure of hadrons. Physicists introduced phenomenological models such as the M.I.T. bag model, the bag approximation and the soliton bag model to study the hadronic properties.

At the scale of the phenomenons under study, the non-relativistic approximation cannot be done. The kinetic energy of the particles (quarks) is no longer described by the Schrödinger operator $-\Delta$ but by the Dirac operator instead.

We are interested in existence results of a ground state solution for the soliton bag and the bag approximation models thanks to the concentration compactness principle.

We show moreover that the energy functionals of the bag approximation model are Γ-limits of sequences of soliton bag model energy functionals for the ground and excited state problems. The pre-compactness, up to translation, of the sequence of ground state solutions associated with the soliton bag energy functionals in the non-symmetric case is obtained combining the Γ-convergence theory and the concentration-compactness method.

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