Spontaneous Symmetry Breakings in the Linear Sigma Model at finite density

Fábio L. Braghin *

Nuclear Theory and Elementary Particle Phenomenology Group,
Instituto de Física, Universidade de São Paulo
C.P. 66.318; CEP 05315-970; São Paulo - SP, Brazil.

Abstract

The O(4) invariant linear sigma model coupled to baryons and a massive vector gauge meson is considered for the description of the finite baryonic density system assuming it the linear realization of chiral symmetry can be a good frame for describing finite density nuclear matter [1]. The stability equation is analyzed in the homogeneous limit. Solutions are sought semi-analytically with prescriptions for the stability of the system. All the bosonic components are found to have non zero expected classical values, including the pion, at finite density corresponding to condensates of dynamical symmetry breakings [2]. At high densities the symmetries may be restored, the most accepted behavior, or may be further broken [3]. There also exists a non trivial solution for the classical vector meson field, as another condensate, indicating the occurrence of a gauge dynamical symmetry breaking at finite density.

PACS numbers: 11.15.Ex; 11.30.Rd; 12.38.Aw; 12.39.Fe.

Key-words: Spontaneously symmetry breaking, finite density, gauge symmetry, chiral symmetry, condensates, isospin.

References

[1] G.E. Brown and M. Rho, Phys. Rep. **269**, 333 (1996).

[2] F.L. Braghin, *in preparation* and *submitted to publication.*

[3] F.L. Braghin, Phys. Rev. **D 64**, 125001 (2001).

*e-mail: braghin@if.usp.br