Chemical potential as a source of stability for gravitating skyrmions

M. Loewe, S. Mendizabal, and J. C. Rojas

Abstract

A discussion of the stability of self-gravitating Skyrmions, with a large winding number N, in a Schwarzschild type of metric, is presented for the case where an isospin chemical potential is introduced. It turns out that the chemical potential stabilizes the behavior of the Skyrmion discussed previously in the literature. This analysis is carried on in the framework of a variational approach using different ansatze for the radial profile of the Skyrmion. We found a divergent behavior for the size of the Skyrmion, associated to a certain critical value μ_c of the chemical potential. At this point, the mass of the Skyrmion vanishes. μ_c is essentially independent of gravitating effects. The stability of a large N skyrmion against decays into single particles is also discussed.