Nucleon structure function at finite density in the NJL model

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The investigation of the nucleon structure functions is a very active field of current research [1,2,3]. On the theoretical side, it is very difficult to use QCD directly for their description, although it is now possible to calculate the first few moments in lattice QCD and discuss the extrapolation to the chiral limit [4]. For a direct description of structure functions, however, effective quark theories, like bag models [5], soliton models [6] and Faddeev descriptions [7,8], are successful models and play important roles.

Our aim is to investigate the medium effects on the nucleon structure functions, that is, the EMC effect in nuclear matter [9]. In a recent work [10], a stable nuclear matter equation of state has been obtained in the Nambu-Jona-Lasinio (NJL) model, combining the quark-scalar diquark description of the nucleon with the mean field (Hartree) description of the nuclear matter ground state by using a hybrid model. For the stability of nuclear matter it is essential to incorporate confinement effects phenomenologically so as to avoid unphysical decay thresholds. This has been done by introducing an infrared cut-off, in addition to the usual ultraviolet one, in the proper time regularization scheme [11].

We will present our results for the EMC ratio in nuclear matter based on the NJL model for the nucleon and the nuclear matter equation of state, and compare with the parametrized fits to the experimental data [12].

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