RELATIVISTIC QUARK-DIQUARK MODEL FOR THE NUCLEON

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We developed a constituent quark model for the nucleon and its resonances, by considering the quark-diquark approach to describe its properties, with focus in the mass spectrum. Some recent works have used diquarks to study baryonic bound states, obtaining good results in comparison with three-quark models. In the baryon spectrum, three quark models predict some states that have not been experimentally observed, which also do not appear in the quark-diquark model. The diquark will be considered as a point particle with quantum numbers of spin and isospin corresponding to coupling of two quarks. Specifically, the relativistic effects are included in the Hamiltonian by means of relativistic kinetic energy operators. It has been shown that a non-relativistic quark-diquark model can provide a general good description of the mass spectrum. However, relativistic effects need to be considered in case of light quark interactions, such that they must be important in the case of the nucleon. We use the Cornell potential to represent the interaction of the quark and the diquark, as well as some other phenomenological potentials. We conclude on the relevance of relativistic effects in our approach, where the angular moment and isospin dependence of the potential must be included in the Hamiltonian to obtain the mass spectrum in detail. The results obtained in the present work are quite stimulating, such that in a future study we intend to consider a microscopic description for the diquark in the model.

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