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Nucleon-nucleon interactions within an extended linear sigma model

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In the intermediate- and low-energy regime, hadrons (instead of quarks and gluons) are the relevant degrees of freedom. Their masses and interactions can be well described by effective approaches to QCD. The extended linear sigma model is an effective model based on chiral and dilatation symmetries (together with their explicit as well as spontaneous breaking). It includes (axial-) vector mesons in addition to (pseudo-) scalar ones, which turns out to be very successful in describing the mass spectrum and decay widths of mesons up to 1.7 GeV [1,2].

Moreover, including two baryon doublets in the so-called mirror assignment as suggested in [3] allows for introducing a chirally invariant mass term for baryons as well as the interaction with a low-mass four-quark field, related to the resonance $f_0(500)$. Thus, the mass of the nucleon arises not solely from the chiral condensate, but also from the four-quark condensate [4,5,6].

The model has been used to describe elastic nucleon-nucleon collisions as well as inelastic nucleon-nucleon interactions involving the production of mesons and electromagnetic radiation. A comparison of the theoretical results with experimental data will be shown.

References:

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