

Author's feedback:

To the three new comments of the referee:

It may be right that certain Lagrangians containing third order derivatives can lead to unphysical negative energy solutions, but the present Lagrangian does not lead to such problems (see my first response to the comments of the referee). This can be clearly seen in the results presented: without external parameters and only three internal parameters, heavily overconstrained by about ten boundary conditions, an excellent description of binding energies, masses and radii is obtained for different systems.

The claim that the binding of fermions alone is not sufficient to describe the motion of free particle bound states is correct for an explicit description of these systems: the kinetic energy of the fermions has to be absorbed by neutral particles (bosons), otherwise the motion of the fermions would be spurious! But in an "effective" description, as in QED or QCD, this mechanism is not seen; it is absorbed in the "effectiveness" of the theory and the external parameters.

To the final comment of the referee: Of course, QCD is an "effective" theory with external parameters (as the other theories of the Standard Model). But for a really fundamental theory external parameters are not allowed! (these could be determined only in an even more fundamental theory).

In this connection it is interesting to cite an older version of the Review of Particle Physics, see e.g. Phys. Rev. D66 (2002). The chapter on "Grand Unified Theories" starts with the sentences: "In spite of all the success of the Standard Model, it is unlikely to be the final theory. It leaves many unanswered questions. ... and has many arbitrary parameters ... and 12 fermion masses."

Since that time no real progress has been made in the theory of fundamental forces. Extensions of current theories don't help to reduce the number of external parameters: in contrary, to include e.g. supersymmetry or gravity additional fields are needed, which increase further the number of external parameters.

The present manuscript is the result of an attempt to go beyond effective theories, which need external parameters, to a theory without. The obtained results show that an explicit bound state description needs indeed no external parameters and may therefore well be the final fundamental theory.