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Energy-momentum tensor, D-term and long-range forces: a case study in a classical model of the proton

The prospects of accessing information on the hadronic form factors of the energy-momentum tensor (EMT) have attracted a lot of interest in literature. This concerns especially the D-term form factor $D(t)$ with its appealing interpretation in terms of internal forces. With the focus on hadron structure, so far theoretical and model studies concentrated on strongly interacting systems with short-range forces. Not considered so far were long-range forces like electromagnetic interaction, which is thought to play a negligible role for the balance of forces inside the proton. But the long-range nature of electromagnetic forces introduces features that were not encountered before. We use a case study in a classical model of the proton to show how the presence of long-range forces alters some notions which can be taken for granted in short-range systems. The important conclusion is that a more careful definition of the D-term may be required when long-range forces are present.

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