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Contact interaction study of proton parton distributions

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Using a symmetry-preserving formulation of a vector × vector contact interaction (SCI) and treating the proton as a quark + interacting-diquark bound state, whose structure is obtained by solving a Poincare covariant Faddeev equation, we provide a comprehensive, coherent set of predictions for unpolarised and polarised proton parton distribution functions (DFs): valence, glue, and four-flavour separated sea. The results enable many themes to be addressed, including: the asymmetry of antimatter in the proton; the neutron:proton structure function ratio; helicity retention in hard scattering processes; the charm quark momentum fraction; the sign and size of the polarised gluon DF; and the origin of the proton spin. In all cases where sound analyses of data are available, SCI predictions are semiquantitatively in agreement with the results. Those mismatches which exist are typically attributable to the momentum-independence of the underlying interaction. Judiciously interpreted, the SCI delivers a sound and insightful explanation of proton structure as expressed in DFs.

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