

The spin of the proton in chiral effective field theory

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Proton spin is investigated in chiral effective field theory through an examination of the singlet axial charge, a_0 , and the two non-singlet axial charges, a_3 and a_8 . Finite-range regularization is considered as it provides an effective model for estimating the role of disconnected sea-quark loop contributions to baryon observables. Baryon octet and decuplet intermediate states are included to enrich the spin and flavour structure of the nucleon, redistributing spin under the constraints of chiral symmetry. In this context, the proton spin puzzle is well understood with the calculation describing all three of the axial charges reasonably well. The strange quark contribution to the proton spin is negative with magnitude 0.01. With appropriate Q^2 evolution, we find the singlet axial charge at the experimental scale to be $\hat{a}_0 = 0.31^{+0.04}_{-0.05}$, consistent with the range of current experimental values.