Partial conservation of axial current and axial exchange currents in the nucleon

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We discuss the axial form factors of the nucleon within the context of the nonrelativistic chiral quark model[1]. Partial conservation of axial current (PCAC) imposed at the quark operator level enforces an axial coupling for the constituents quarks g_{Aq} which is smaller than unity. Values of g_{Aq} smaller than one have been derived in different models[2] all in agreement with our determination based on PCAC. The fact that g_{Aq} is smaller than one leads naturally to an axial coupling constant of the nucleon g_A in good agreement with experiment. PCAC also requires the inclusion of axial exchange currents. Their effects on the axial form factors are analyzed. We find only small exchange currents contributions to g_A, which is dominated by the one-body axial current. On the other hand, axial exchange currents give sizeable contributions to the axial radius of the nucleon r_A^2, and to the non-pole part of the induced pseudoscalar form factor g_P for which our value agrees in sign and magnitude with the Adler-Dothan-Wolfenstein[3] result. For the tensor form factor g_T we obtain exactly 0 for all values of q^2. This is a welcome result that shows the consistency of our model with G-parity.

References

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