Baryon form factors with a Poincaré covariant current operator

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Within the relativistic Front-Form Hamiltonian dynamics for systems of interacting particles, an electromagnetic current operator has been obtained that satisfies: i) Poincaré, parity and time-reversal covariance, ii) Hermiticity and current conservation, [1]. It is constructed starting from the free current in the Breit frame where the three-momentum transfer is along the spin quantization axis, z. The resulting current has a two-body contribution and it is not plagued by the well-known ambiguities of previous Front-Form models, based on the free current in the $q^+ = 0$ frame (see, e.g. [2]). In this contribution the baryon form factors obtained with the Poincaré covariant current in a constituent quark (CQ) model are presented. The model features: i) eigenstates of a mass operator describing a large part of the baryon spectrum [3]; ii) phenomenological Dirac and Pauli form factors for the CQ's. The CQ form factors have been determined by a fit to the experimental data for the nucleon electromagnetic form factors (see Fig. 1). Then, without any further free parameter, the Poincaré covariant current can be used to evaluate the transition form factors to the main baryonic resonances.

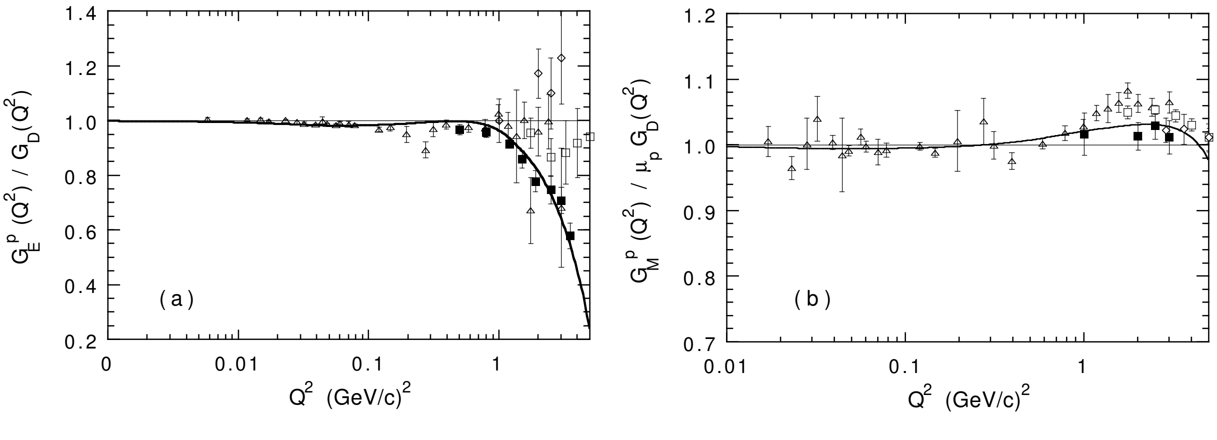

Figure 1: The ratio G_E^p/G_D (with $G_D = (1 + Q^2/0.71)^{-2}$) (a), and the ratio $G_M^p/(\mu_p G_D)$ (b) vs Q^2 calculated with: i) the Poincaré covariant current operator; ii) the Front-Form proton wave function corresponding to the mass operator of Ref. [3]; iii) phenomenological constituent quark form factors (see text).

References

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