ID contributo: **31** Tipo: **non specificato**

Coherent description of the space and time structure of hadrons

martedì 18 ottobre 2022 15:20 (20 minuti)

Hadron electromagnetic form factors describe the intrinsic dynamics of the charge and magnetic distributions in composite particles. They are experimentally accessible through (un)polarized cross sections measurements and angular distributions in the crossing symmetry related reactions : electron-hadron elastic scattering and electron-positron annihilation into hadron-antihadron (and its time reverse). Assuming that these reactions occur through the exchange of a virtual photon of squared four momentum q2, form factors parametrize the hadron electromagnetic current, being functions of only one variable, q2. Very recently, precise data were collected in the annihilation region by the BESIII collaboration, with the first separation of electric and magnetic form factors (in moduli) as well as unique data on the neutron. We will present a coherent description of the world data in space and time-like regions, that accounts for the main features of form factors, namely the monopole decrease of the electric to magnetic form factor ratio. We give an interpretation to the specific structures observed in the time-like region that become regular when plotted as a function of the relative momentum of the formed hadrons. Our model suggests the presence of an inner neutral screened region at very small distances and of a significative diquark component at a specific phase of the hadron formation. Interesting correlations are visible among proton, neutron and also hyperon form factors, that allow to fix the scale of the time evolution of the system from the annihilation point. For the space-like region, the model predicts that the electric form factor will stay small at large energies, with no zero crossing.

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Classifica Sessioni: Parallel 3

Classificazione della track: Baryon structure through meson electroproduction, transition form factors, and time-like form factors