Dynamical model for the elastic and radiative pion-nucleon scattering and the dipole magnetic moment of the Δ^{++}.

Alejandro Mariano

Universidad Nacional de La Plata
cc.67 , 1900 La Plata, Argentina
e-mail: mariano@venus.fisica.unlp.edu.ar

Abstract

We study the Δ^{++} contributions to elastic and radiative π^+p scattering within an effective Lagrangian model which incorporates the Δ, N, ρ and σ meson degrees of freedom. This model provides a description of the Δ resonance and its interactions that respects electromagnetic gauge invariance and invariance under contact transformations when finite width effects are incorporated. Following recent developments in the description of unstable gauge bosons, we use a complex mass scheme to introduce the finite width of the Δ^{++} without spoiling gauge invariance. The total cross section of elastic π^+p scattering, whose amplitude exhibits the resonant plus background structure of S-matrix theory, is used to fix the mass, width and strong coupling of the Δ resonance. The differential cross section of elastic scattering is found in very good agreement with experimental data. The magnetic dipole moment of the Δ^{++}, μ_Δ, is left as the only adjustable parameter in radiative π^+p scattering. From a fit to the most sensitive configurations for photon emission in this process, we obtain $\mu_\Delta = (6.14 \pm 0.51)e/2m_p$, in agreement with predictions based on the SU(6) quark model.