Proton Dynamics with Direct qqq Force

A.N.Mitra *

244 Tagore Park, Delhi-110009, India

Abstract

The analytic structure of the qqq wave function, obtained recently in the high momentum regime of QCD, is employed for the formulation of baryonic transition amplitudes via quark loops. A new aspect of this study is the role of a direct (Y-shaped, Mercedes-Benz type) qqq force in generating the qqq wave function The dynamics is that of a Salpeter-like equation (3D support for the kernel) formulated covariantly on the light front, a la Markov-Yukawa Transversality Principle (MYTP) which warrants a 2-way interconnection between the 3D and 4D Bethe-Salpeter (BSE) forms for 2 as well as 3 fermion quarks. The dynamics of this 3-body force shows up through a characteristic singularity in the hypergeometric differential equation for the 3D wave function ϕ, corresponding to a *negative* eigenvalue of the spin operator $i\sigma_1.\sigma_2 \times \sigma_3$ which is an integral part of the qqq force. As a first application of this wave function to the problem of the proton spin anomaly, the two-gluon contribution to the anomaly yields an estimate of the right sign, although somewhat smaller in magnitude.
Keywords: 3bodyforce; proton-spin ; 2gluon anomaly ; fractional correction θ

*Email: (1)ganmitra@nde.vsnl.net.in; (2)anmitra@physics.du.ac.in