Single Spin Asymmetry in Strongly Correlated Quark Model

Genis Musulmanbekov

Joint Institute for Nuclear Research, RU-141980 Dubna, Russia

Keywords: quark correlations, spin, vortical soliton, hadronic current, single spin asymmetry.

Single spin asymmetry (SSA) in polarized proton – proton scattering is analyzed in the framework of the Strongly Correlated Quark Model (SCQM), elaborated by the author. We describe the spin of the proton as arising from the orbital momentum of quark and gluon condensate circulating around the valence quarks. The model leads to the representation of constituent quarks as vortical solitons.

According to the factorized parton model the differential cross sections in reactions

$$p^{\uparrow} + p \to \pi^{\pm 0} + X$$

is a convolution of three factors:

$$\sigma_{p\to\pi} \approx f_q \otimes \sigma_{q\to q'} \otimes D_{\pi/q'}$$

where f_q is the parton distribution in the polarized proton, $\sigma_{q\to q'}$ is the parton – hadron cross section and $D_{\pi/q}$ is the parton fragmentation function. Each factor in this equation may or may not depend on spin. Hence the contribution to azimuthal asymmetry could come from any of these factors. Several authors in a series of papers argued that the Collins effect (third factor) alone could explain the data. According to our calculations this factor is insufficient for satisfactory explanation of data. We demonstrate that no one factor separately do not describe SSA data: all three factors depend on the proton transverse spin and give contribution to SSA (Fig. 1).

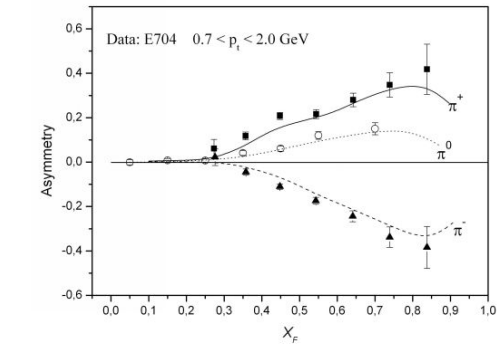

FIGURE 1. Comparison of the results of our calculations with E704 data.