

## Spin Content of Proton in Strongly Correlated Quark Model

G. Musulmanbekov

Joint Institute for Nuclear Research, Dubna, Russia

Email: [genis@jinr.ru](mailto:genis@jinr.ru)

Proposed by author the semiclassical model of strongly correlated quarks, demonstrated the interconnection between constituent and current quark models [1]. The model leads to the representation of constituent quarks as solutions. Quarks inside hadrons can be described by “breather” mode solution of sine-Gordon equation for scalar field: quark and antiquark in mesons and three quarks in baryons oscillate around the origin in correlated motion. Derived interquark potential explicitly demonstrates that relativistic (current) quark configurations are located at the origin of oscillation and constituent (nonrelativistic) quarks are at maximal distances, correspondingly. In intermediate region there is a transition from current to constituent quarks with constituent mass generation. This transition is an explicit manifestation of chiral symmetry breaking. Calculated valence quark structure functions are in a good agreement with experimental data. The model gives predictions for energetic behavior of total and single diffractive cross sections [2]. Inclusion of spin brings to spinning quarks solutions or extended vortex representation of constituent quarks. It is shown that the dominating contribution to proton spin comes from orbital angular momentum of gluons and sea  $\bar{q}q$ -pairs circulating around the oscillating valence quarks. This mechanism gives an alternative solution of spin crisis. The sizes of constituent and current (bare) quarks are estimated. The model predicts the difference of total cross sections between longitudinally and transversely polarized states in  $pp$ - and  $\bar{p}p$ -collisions.

### References

- [1] Musulmanbekov in *Frontier of Fundamental Physics 4*, Ed. B.G. Sidharth, Kluwer Acad./Plenum Pub., 2001, p.109.
- [2] G. Musulmanbekov in Proc. IX Blois Workshop on Elastic and Diffractive Scatt., Prague, 6/9-15/2001, p. 339.