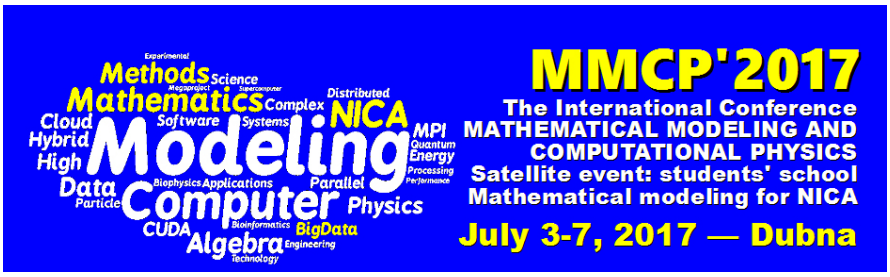

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Modeling the quarks' helicity flipping stimulated by their confinement potential

Monday 3 July 2017 16:00 (15 minutes)

The proton spin puzzle is known since 1988 after measurements of quarks' helicity contribution to the proton spin [1]. In spite of all efforts applied, the problem remains an unresolved enigma of high-energy physics till now (see [2] and references therein). It has been recently shown that the confinement of quarks induces a change of their helicities together with a simultaneous alteration of orbital momenta, so that the total angular momentum of each quark is conserved [3]. As a necessary consequence, a superposition of states with opposite helicities of quarks should appear. Thus, contribution of quarks helicities to the proton polarization may be much less than it is expected on the ground of the conventional picture of entirely free partons. In principle, this mechanism might be considered as a solution to the proton spin puzzle.

In present communication, such a scenario is verified on basis of the Dirac equation written in the cylindrical coordinates. Firstly a resulting system of differential equations was tried to be solved numerically with MAPLE assisted standard methods such as Runge-Kutta-Fehlberg algorithm (the rkf45 procedure) and a finite difference technique with the Richardson extrapolation (the bvp procedure). Unfortunally, none of them was able to reproduce the confinement of quarks in the usual linearly increasing attractive potential. A method of numerical solution of the system describing the quarks' helicity flipping as well as their confinement is proposed in this report.

References

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