Dual Spin Statistics in Hadrons

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Abstract

Few additional particles which possibly exist are pointed out here. The outcomes must be vindicated by experimental approaches in super energetic accelerators. The predicted particles are strongly interacting composite particles with "colored quarks" as its basic constituents.

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The standard model explains matter of about five percent in overall observable universe, the fact that something lies beyond the above mentioned statistics is clearly established by experiments but no interpretation have been proposed so far. The modification of standard model must lie in two objects first what are we observing and how do we explain them. The success of quantum Chromodynamics [1] in particle physics is overwhelming and precise (till date) verified by experiments. However as we mentioned "not everything". We will propose some additional particles based on spin, our particles which we deduced are both fermions and bosons simply dual spin statistics in Hadrons.

Idea of quarks [2] led us to formulate the new quantum number "color charge" which was essentially needed to prevent the precise violation of exclusion principle [3]. The group SU(3) is a gauge group contains three color charges, which means each of six flavors of quarks must possess three different color charges (6×3). QCD is based on this gauge group and its vector boson (gauge) is massless gluon. We will use basic ideas to build the theory discussed here. Quarks comes in both types of charges +2/3 and -1/3, the first relation is to relate quarks Charges Q with other QCD observables, simply relation baryon number and strangeness.

$$\left[\frac{Q}{eS_\mu} - B - S + C_\tau - 2\alpha_s\right] = 0 \; for \; quark \; of \; charge \; -\frac{1}{3}e(except \; strange \; quark, s = -1)$$

The above equation excludes the strange quark from obeying.

Secondly, for others we have

$$\left[\frac{Q}{eS_\mu} - B + S - C_\tau + 2\alpha_s\right] = 0 \; for \; all \; quarks \; of \; charge \; of \; +\frac{2}{3}e$$

$$C_\tau = N_c, SU(3) gauge \; group$$

Where α_s is the gauge coupling strength in color force this equation shows the relation of the quarks electric charge, strangeness quantum number, baryon number, ratio of quark to gluon spin S_μ, gauge color group and strong interaction gauge coupling. To make things right the value of coupling constant is taken as unity. This equation(s) only holds for strong coupling (unity) as because we are trying to predict new composite strongly interacting particles based on spin. Such above expressions leads to a form of

equations which eventually predicts strongly interacting particles made of basic constituents called quarks.

$$J_B = \hbar[I_3 + C_\tau - 2\alpha_s] eq\ 1$$

I_3 is the isospin of quarks.

Eq1 deduces composite particles of spin 1/2, spin 3/2 and spin 1, clearly first two are fermions and the third is boson. By assuming that such particles of above mentioned spin exist and no matter what particle but simply it exist, experiments have confirmed this states. Other equations will show the best outcomes.

$$J_B = \hbar[2I_3 + C_\tau - 2\alpha_s] eq2$$

$$J_B = \hbar[3I_3 + C_\tau - 2\alpha_s] eq\ 3$$

$$J_B = \hbar[5I_3 + C_\tau - 2\alpha_s] eq4$$

$$J_B = \hbar[4I_3 + C_\tau - 2\alpha_s] eq5$$

$$J_B = \hbar[6I_3 + C_\tau - 2\alpha_s]\ eq6$$

Based on typical calculations we propose that particles of spin are favorable outcomes. The spin of same types with opposite charges means downward spin or simply antiparticle. The other calculated particle's spin(s) are as follows: +2, 0, 1, +5/2, -1/2, +1, +3, -1, 1, +7/2, -3/2, 1, 4, -2, 1. Therefore one can observe that the outcomes indicates both Fermions and Bosons, simply dual statistics. However spin +1/2, +3/2, 0, 1 are observed but others +5/2, +3, +2, -2, +7/2, +4 are not discovered hence we showed the existence of these particles theoretically. However for once and for all we need to experimentally demonstrate its concrete existence in large scale (energy) particle collider, perhaps CERN. Another expression deduced which allows only particle of spin +2 and -2 based on charges of quark inserted on it.

$$J_B = \hbar\left[2\left(\frac{Q}{S_\mu} - B\right)\right]$$

For charge +2/3 particle is +2 and for charge -1/3 particle is -2 (antiparticle).

We do believe that this indication is a basic picture and needs more theoretical work on this.

References

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[3] Nobel Lecture 1945, Wolfgang Pauli, Nobelprize.org