SPECTRUM OF HADRONS IN THE QUARK-DIQUARK MODEL WITH BROKEN COLOR SYMMETRY

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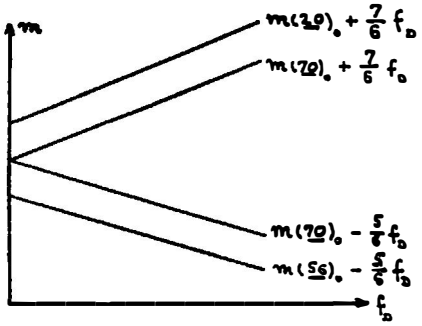
The symmetric SU(6) quark model with a harmonic shell model interaction has had many successful applications to hadronic spectroscopy and reactions. The SU(6) quark model predicts for baryons the exsistence of 20-, 56- and 70-dimensional representations. The exsistence of a 20-dimensional SU(6) multiplet is not supported by the present experimental situation,[1] even though this representation is totally antisymmetric and thus expected to correspond to the lowest-lying baryonic states.

Recently we have proposed[2] a color quark model based on the dynamical group SU(6)×SL(3,R). In this model the masses of the lowest-lying N-quark states are given by

$$m = m^{color} - \sum_{i<j} \sum_{a=1}^{35} f(i,j)\, G_a^{(i)} G_a^{(j)} , \qquad (1)$$

$G_a^{(i)}$ being the SU(6) generators acting on the i-th quark.

Capps has recently suggested[3] that color is not an exact symmetry and that in a baryon two of three quarks are stronger bound to form a diquark. We diagonalize, under this assumption, the mass operator of (1) and obtain $m(\underline{56}) < m(\underline{70}) < m(\underline{20})$, in agreement with experiment. In particular we predict $m(20) = (2.22 + 2f_D)$ GeV, where f_D is the diquark coupling constant. Mass splitting of the SU(6) baryon multiplets vs. f_D is presented on the diagram. This approach provides a dynamical justification of the previously suggested quark-diquark model[4].



References

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