Separation of meson and quark-gluon degrees of freedom in the relativistic equations of the field theory.

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This talk is devoted to the analysis of how one can reveal the pure quark-gluon interaction effects in scattering of the hadrons, considered as the quark clusters. The rigorous solution of this problem is possible in the framework of the traditional quantum field-theoretical approach. This is done by generalization of the conventional field-theoretical S-matrix reduction techniques for interacting bound states. In particular, the self-consistent generalization of the S matrix reduction formulas for the case of the composite particles was founded by Haag, Nishijima and Zimmermann [1]. Relativistic three-dimensional description of the hadron interaction as quark clusters interaction has been suggested [2]. This relativistic three-dimensional formulation is analytically connected with the four-dimensional Bathe-Salpeter equations and it is not restricted to a specific effective quark-gluon interaction Lagrangian. Therefore any dynamical mechanism can be incorporated in this scheme.

The suggested Lippmann-Schwinger-type three dimensional equation for the hadron scattering amplitude with only one off- mass shell hadron satisfies all the first principles of field theory. For instance, in the effective potential of these equations one can simply separate the contributions of the quark-gluon and meson degrees of freedom. and the solutions of these equations ensure the unitarity condition. Hence, there are no ambiguities caused by the double counting. Moreover, the structure of the general field-theoretical potential in the suggested equations leads to some constrains for the quark masses and for the quark-meson vertex functions. The several applications to πN, NN and γN scattering reactions are obtained.

References

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