Quasilocal Quark Models as Effective theory of QCD

A.A.Andrianov [a,b] and V.A.Andrianov [a]

[a] *V.A.Fock Department of Theoretical Physics, Sankt-Petersburg State University, 198504 Sankt-Petersburg, Russia*
[b] *Istituto Nazionale di Fisica Nucleare Sezione di Bologna, 40126 Bologna, Italia*

The Quasilocal Quark Models (QQM) are elaborated as effective theory of QCD at low and intermediate energies. When the QCD effective action is built at the CSB (chiral symmetry breaking) scale by means of perturbation theory it has the structure [1] of a generalized Nambu-Jona-Lasinio (NJL) model with CSB due to attractive forces in the scalar channel. We show that if the lowest scalar meson state is sufficiently lighter than the heavy pseudoscalar π' then QCD favors a low-energy effective theory in which higher dimensional operators (of NJL type) are dominated and relatively strong. The dynamical chiral symmetry breaking at low energies and the chiral symmetry restoration at high energies are employed to describe the hadronization of QCD in the quark sector [2]. QQM with four quark interaction including derivatives, in strong coupling regime, describes not only ground states of scalars, pseudoscalars, vectors and axial-vectors mesons but also their radial excitations [3]. The appropriate set of Chiral Symmetry Restoration sum rules for these mesons are imposed as matching conditions to QCD at intermediate energies. The mass spectrum and a number of decay constants for ground and excited meson states are calculated and compared with exisiting particle data.

References

[1] A.A.Andrianov and V.A.Andrianov, Theor.Math.Phys. **93** (1992) 1126;
Int.J.Mod.Phys. **A8** (1993) 1981.
[2] A.A.Andrianov and V.A.Andrianov, Proc. of the Int.Workshop on Hadron Physics, Coimbra 1999, ed.by A.H.Blin et.al., N.Y., AIP, (2000) 328; hep-ph/9911383.
[3] A.A.Andrianov, V.A.Andrianov and S.S.Afonin, hep-ph/0101245.