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Domain wall networks as QCD vacuum

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An approach to QCD vacuum as a medium describable in terms of statistical ensemble of almost everywhere homogeneous Abelian (anti-)self-dual gluon field is briefly reviewed. These fields can be seen as the confining medium for color charged fields as well as underline the specific realization of chiral $SU_{\rm L}(N_f) \times SU_{\rm R}(N_f)$ and $U_A(1)$ symmetries. The long-range fluctuations of topological charge density play important role both for confinement and chiral symmetry breaking.

Hadronization formalism based on this ensemble leads to manifestly defined quantum effective action for colorless hadrons. Strong, electromagnetic and weak interactions of mesons are represented in the action in terms of nonlocal n-point interaction vertices given by the quark-gluon loops averaged over the background ensemble. Systematic results for the mass spectrum and decay constants of radially excited light, heavy-light mesons and heavy quarkonia as well as electromagnetic form factors are presented. Interrelations between the present mean field type approach and the results of functional renormalization group and DSE results are discussed.

Peculiarities of the approach in description of deconfinement and chiral symmetry restoration under extreme conditions (strong electromagnetic fields, high energy and baryon densities) are outlined.

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