fluctuations around this minimum. We represent $\chi = \overline{\chi} + \hat{\chi}$ and $U = \overline{U} + \hat{U}$, where $\overline{\chi}$, $\overline{U}$ are c-number functions (the mean field parts), and $\hat{\chi}$, $\hat{U}$ denote quantum operators (describing the excitations). The physics behind this separation is that the coupling of χ to ψ, $\overline{\psi}$, A^μ, as well as to U, will make the composite fields χ and U dynamical variables, so that the fluctuations around the mean fields $\overline{\chi}$ and $\overline{U}$ will propagate and form collective excitations. Therefore the system is characterized (aside from the elementary fields ψ, $\overline{\psi}$, A^μ) by the mean fields, as well as by the collective excitations with their own energy spectrum and distribution. With this prescription we can treat the local interaction of the partonic fluctuations with the coherent field analogously to the familiar problem of quantum fields $(\psi, \overline{\psi}, A^\mu)$ interacting with a classical "external" field $(\overline{\chi})$, which converts the partons to color-singlet clusters or bubbles corresponding to excitations in the coherent field $(\hat{\chi})$. Specifically, in our approach the bubbles represent non-topological soliton configurations which are stable, classical solutions of the equations of motions, as have been studied for instance by Friedberg and Lee [9] and Coleman [26]. We do not include here the possible additional interactions between partons and bubbles, or among bubbles themselves.

(ii) It is convenient to work in a physical (axial) gauge [29, 30] for the gluon fields, generically given by choosing the gauge function $\xi_a(A)$ in (5) as

$$\xi_a(A) \;=\; -\,\frac{1}{2\alpha n^2}\,\partial_\lambda(n\cdot A_a)\partial^\lambda(n\cdot A_a)\;, \tag{42}$$

where α is the gauge parameter, and n^μ is a constant vector with $n^2 \neq 0$. In particular, we will set $\alpha = 1$ which is known as the planar gauge. In contrast to covariant gauges where $\xi_a(A) = -1/(2\alpha)(\partial\cdot A_a)^2$, the class of gauges (42) is well known to have a number of advantages. It is ghost-free, i.e. the ghost field contribution in (19) decouples and drops out. Also, the so-called Gribov ambiguity is not present in this gauge. Another feature of (42) is that the gluon propagator involves only the two physical transverse polarizations, so that the equations (34) and (35) simplify considerably [19]. Furthermore, it allows for a rigorous resummation of the perturbative series at high energies in terms of the leading logarithmic contributions and consequently leads to a simple probabilistic description of the perturbative parton evolution within the (Modified) Leading Log approximation (MLLA) [31, 32] in QCD.

(iii) We will evaluate iteratively the 2-point Green functions $\mathcal{S}$ and $\mathcal{D}$ of quarks and gluons,