

measure. We choose (64), because it has the advantage that it is manifestly Lorentz-invariant and has a simple interpretation as the two partons' spatial separation in their center-of-mass frame.

We assume that the dominant contribution to bubble formation arises from 2-parton fusion and ignore recombinations of 3 or more partons. This is reasonable, unless the local parton density becomes so large that also the latter processes have a significant probability to occur. We take the same probability distribution  $\pi(L)$  for the various types of configurations, since it depends only on the 'color- and flavor-blind' variable  $L$ , i.e. we set

$$\pi(r, r') = \pi(L) \equiv \pi_{gg \rightarrow \chi\chi}(L) = \pi_{q\bar{q} \rightarrow \chi\chi}(L) = \pi_{gq \rightarrow \chi q}(L), \quad (66)$$

where  $L$  is given in terms of  $r$  and  $r'$  by (65). The various  $\hat{B}$  terms in (46) and (47) can then be expressed generically as:

$$\hat{B}_{ab}^{\chi c} F_a F_b = F_a(r; x, p_\perp^2, p^2) \int d^3 r' \pi(r, r') \int d^4 p' F_b(r'; x', p_\perp'^2, p'^2) \quad (67)$$

where  $a, b = q, \bar{q}, g$  and  $c = \chi, q$ , and  $d^4 p' = dp_\perp'^2 dx'/x'$ . Similarly the  $\hat{C}$  terms in (48) are given by:

$$\begin{aligned} \hat{C}_{ab}^{\chi c} F_a F_b &= \int d^3 r' \int d^3 r'' \pi(r', r'') \delta^3 \left( \vec{r} - \frac{\vec{r}' + \vec{r}''}{2} \right) \\ &\times \int d^4 p' d^4 p'' F_a(r'; x', p_\perp'^2, p'^2) F_b(r''; x'', p_\perp''^2, p''^2) \delta^4 \left( p - \frac{p' + p''}{2} \right) \end{aligned} \quad (68)$$

#### 4.5 Hadronic cluster decay

The ensemble of clusters determined by the coupled equations (46)-(48) yields a continuous mass spectrum of color-singlet excitations with different flavor contents corresponding to the types of recombined partons. These states must then decay into physical hadronic states with a discrete mass spectrum. The invariant mass distribution of the formed clusters may be interpreted as a 'smeared out' version of the spectrum of primordial resonances formed in the early stages of the confinement mechanism [31]. It therefore seems reasonable to treat the fragmentation of these central clusters as a kind of averaged resonance decay which, as implied by our locality assumption, must be determined entirely by their invariant masses, flavors and total angular momenta. Each cluster in the resonance spectrum may