Effective QCD LF Bound-state Equation

[GdT and S. J. Brodsky, PRL **102**, 081601 (2009)]

- Factor out the longitudinal $X(x)$ and orbital kinematical dependence from LFWF ψ

$$\psi(x,\zeta,\varphi) = e^{iL\varphi} X(x) \frac{\phi(\zeta)}{\sqrt{2\pi\zeta}}$$

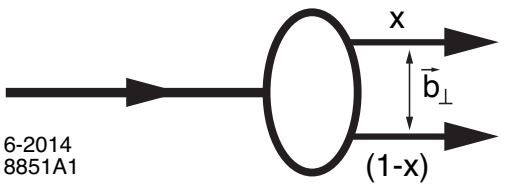
- Ultra relativistic limit $m_q \to 0$ longitudinal modes $X(x)$ decouple and LF Hamiltonian equation $P_\mu P^\mu |\psi\rangle = M^2 |\psi\rangle$ is a LF wave equation for ϕ

$$\left(-\frac{d^2}{d\zeta^2} - \frac{1-4L^2}{4\zeta^2} + U(\zeta) \right) \phi(\zeta) = M^2 \phi(\zeta)$$

- Invariant transverse variable in impact space

$$\zeta^2 = x(1-x)\mathbf{b}_\perp^2$$

conjugate to invariant mass $\mathcal{M}^2 = \mathbf{k}_\perp^2 / x(1-x)$



- Critical value $L = 0$ corresponds to lowest possible stable solution: ground state of the LF Hamiltonian

- Relativistic and frame-independent LF Schrödinger equation: U is instantaneous in LF time and comprises all interactions, including those with higher Fock states.