Exclusive J/psi photoproduction in Pb-Pb UPCs at the LHC in NLO QCD
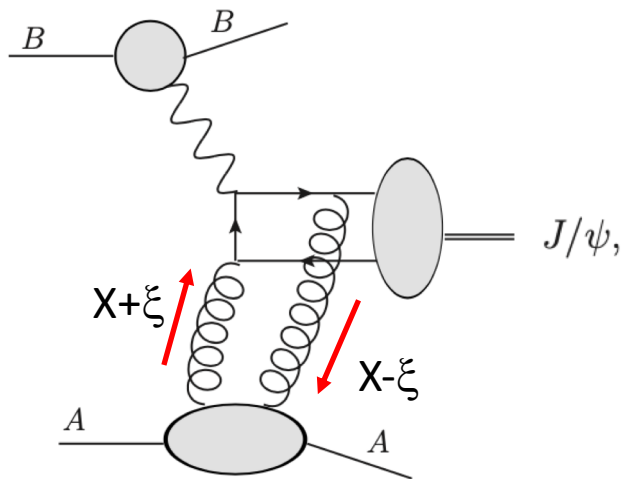
❑ **This is a good example to show why the commonly used formula for UPC does not work**
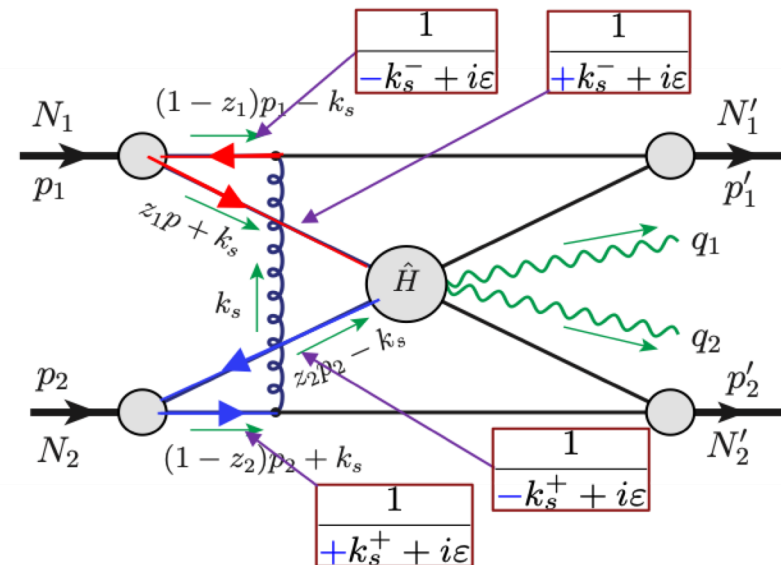

- Approximation for $\dfrac{d\sigma}{dt} \propto [xg(x, Q^2_{\mathrm{eff}})]^2$ is NOT fully justified

- Double diffractive UPC cannot be factorized

  - Glauber pinch singularities in QED!
  - Single diffractive has a chance

    Qiu & Yu, JHEP 08 (2022) 103

  - xg(x) & its x value are not justified

$$\frac{d\sigma^{\gamma p \to J/\psi p}(t=0)}{dt} = \frac{12\pi^3}{\alpha_{\mathrm{e.m.}}} \frac{\Gamma_V M_V^3}{(4m_c^2)^4} \left[\alpha_s(Q^2_{\mathrm{eff}})xg(x, Q^2_{\mathrm{eff}})\right]^2 C(Q^2=0)$$

Γ_V=J/ψ leptonic decay width

gluon density at x=(M$_{J/\psi}$)^2/W^2 and Q$_{\mathrm{eff}}^2$=2.5-3 GeV^2

depends on details of charmonium distribution amplitude

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