Spatial Dependence of Gluon and Quark Shadowing (LO only)

$$E_c E_{\bar{c}} \frac{d\sigma}{d^3p_c\, d^3p_{\bar{c}}\, d^2b\, d^2r} = \sum_{ij} \int dz\, dz'\, dx_1\, dx_2\, F_i^A(x_1, Q^2, \vec{r}, z)\, F_j^B(x_2, Q^2, \vec{b}-\vec{r}, z')\, E_c E_{\bar{c}} \frac{d\hat{\sigma}_{ij}}{d^3p_c\, d^3p_{\bar{c}}}$$

$$= \int dz\, dz'\, x_1 x_2\, C(x_1, x_2, Q^2, \vec{r}, z, \vec{b}-\vec{r}, z')$$

$$C(x_1, x_2, Q^2, \vec{r}, z, \vec{b}-\vec{r}, z') =$$

$$\sum_q \left[F_q^A(x_1, Q^2, \vec{r}, z)\, F_{\bar{q}}^B(x_2, Q^2, \vec{b}-\vec{r}, z') + F_{\bar{q}}^A(x_1, Q^2, \vec{r}, z)\, F_q^B(x_2, Q^2, \vec{b}-\vec{r}, z') \right] \frac{d\hat{\sigma}_{q\bar{q}}}{dt}$$

$$+ F_g^A(x_1, Q^2, \vec{r}, z)\, F_g^B(x_2, Q^2, \vec{b}-\vec{r}, z') \frac{d\hat{\sigma}_{gg}}{dt}$$

$$F_i^A(x, Q^2, \vec{r}, z) = \rho_A(s)\, S^i(A, x, Q^2, \vec{r}, z)\, f_i^p(x, Q^2)$$

$$F_i^B(x, Q^2, \vec{b}-\vec{r}, z') = \rho_B(s')\, S^i(B, x, Q^2, \vec{b}-\vec{r}, z')\, f_i^p(x, Q^2)$$

$$s = \sqrt{r^2 + z^2} \qquad s' = \sqrt{|\vec{b}-\vec{r}|^2 + z'^2}$$

$$\rho_A(s) = \rho_0 \frac{1 + w(s/R_A)^2}{1 + \exp((s - R_A)/d)}$$

ρ_0 from $\int d^2r\, dz\, \rho_A(s) = A$

$A = Au$: $w = 0$ $\quad d = 0.535\,\text{fm}$ $\quad R_A = 6.38\,\text{fm}$ $\quad \rho_0 = 0.1693\,\text{fm}^{-3}$

use both HPC and Eskola shadowing to compare