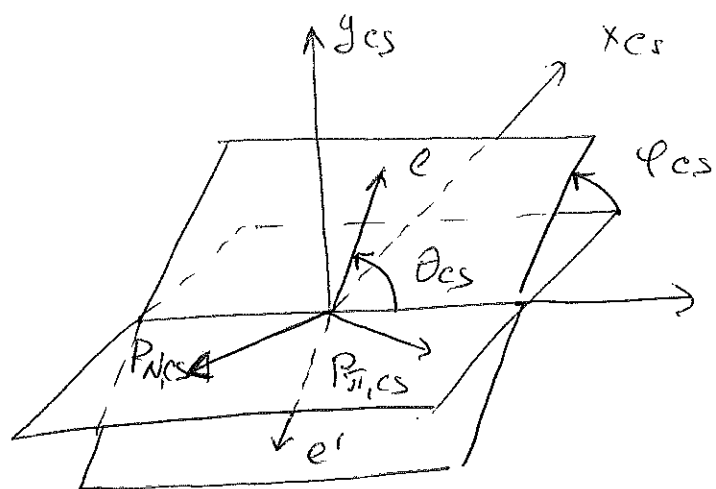


①



Target rest
frame, Collins-Soper
used by Compas

z_{cs} from PRL 119, 112002 (2017)

$$\frac{d\sigma}{dq^4 d\Omega} \propto \hat{\sigma}_u (1 + S_T \{ D_1 A_T^{\sin \phi_s} \sin \phi_s + D_2 [A_T^{\sin (2\phi_{cs} - \phi_s)} \sin (2\phi_{cs} - \phi_s) + A_T^{\sin (2\phi_{cs} + \phi_s)} \sin (2\phi_{cs} + \phi_s)] \})$$

$$\hat{\sigma}_u = (F_u^1 + F_u^2) (1 + \lambda \cos^2 \theta_{cs})$$

$$\lambda = \frac{F_u^1 - F_u^2}{F_u^1 + F_u^2}, \text{ at LO QCD } F_u^2 = 0 \Rightarrow \lambda = 1$$

$$D_1 = \frac{1 + \cos^2 \theta_{cs}}{1 + \lambda \cos^2 \theta_{cs}} \approx 1$$

$$D_2 = \frac{\sin^2 \theta_{cs}}{1 + \lambda \cos^2 \theta_{cs}} \approx \frac{\sin^2 \theta_{cs}}{1 + \cos^2 \theta_{cs}}$$

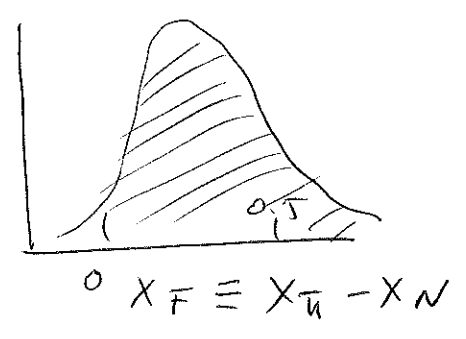
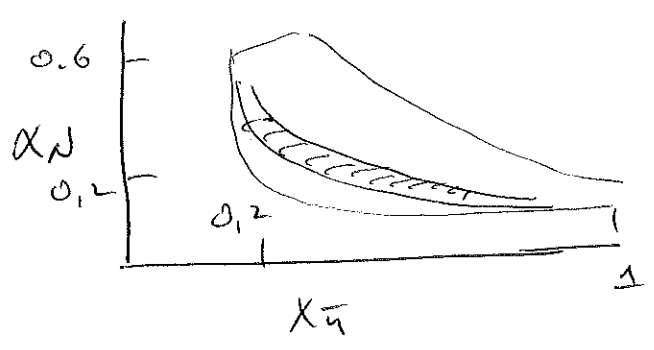
$A_T^{\sin \varphi_S}$ is related to the nucleon Sivers TMD (f_{1T}^\perp) convoluted with the unpolarized pion TMD ($f_{1,\bar{u}}$)

$$A_T^{\sin(2\varphi_S - \varphi_S)} \propto \text{nucleon } h_\perp \otimes \text{pion } h_{\perp,\bar{u}}^\perp$$

$$A_T^{\sin(2\varphi_S + \varphi_S)} \propto \text{nucleon } h_{1T}^\perp \otimes \text{pion } h_{\perp,\bar{u}}^\perp$$

Kinematical variables:

$$\underline{X_N, X_{\bar{u}}, X_F, q_T}$$



The following relations are true:

(3)

$$\frac{d\phi}{dQ^2 dy d^2q_T} = \frac{1}{s} \frac{d\phi}{dx_1 dx_2 d^2q_T} = (x_1 + x_2) \frac{d\phi}{dQ^2 dx_F d^2q_T} \approx$$

$$= \frac{1}{2} \frac{d\phi}{d^4q}$$

$$x_F = x_1 - x_2 \leftarrow \text{PRD 79 054010, Anselmino et al}$$

Notations

$$x_1|_{\text{Anselmino}} = x_a|_{\text{Arnold}} = x_{\bar{u}}|_{\text{Compass}}$$

$$x_2|_{\text{Anselmino}} = x_b|_{\text{Arnold}} = x_N|_{\text{Compass}}$$