Azymuthal asymmetry

$$A_T \left\langle \sin\left(\phi_h + \phi_S\right) \right\rangle (x,y,z) \approx \frac{(1-y)}{\left(1 - y + \frac{y^2}{2}\right)} \frac{h_1(x)\, H_1^{\perp(1/2)}(z)}{f_1(x)\, D_1(z)}$$

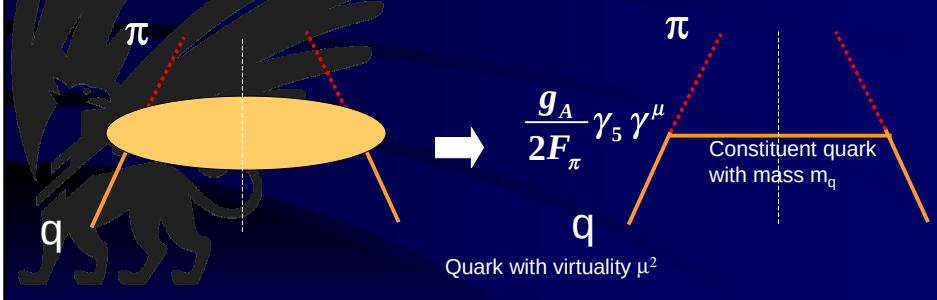
The approximate factorization is spoiled by perturbative corrections and requires the introduction of Sudakov factors in the evolution of the asymmetry.

D. Boer, NPB 603 (2000)

A model for the Collins function

The fragmentation process is modeled in a simple way

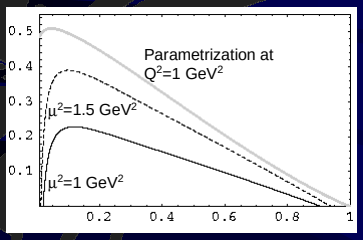
A.B., R. Kundu, A. Metz, in preparation



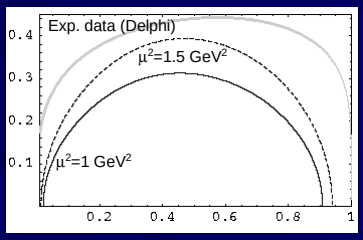
Model results for D_1

The results for the unpolarized quantities are nice, although they depend on the virtuality of the fragmenting quark

$D_1(z)$

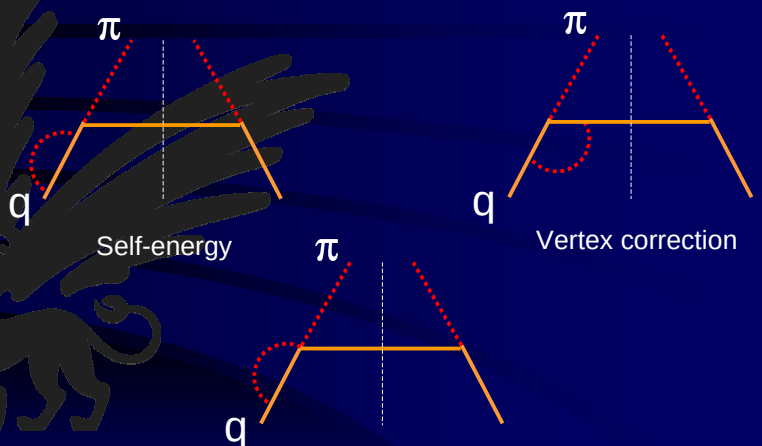


Average transverse momentum



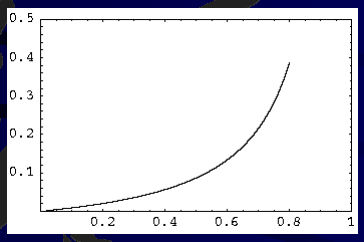
g_A=1 GeV, m_q=0.3 GeV

One-loop corrections to obtain the Collins function



Results for the Collins function

$H_1^{\perp}(z) / D_1(z)$

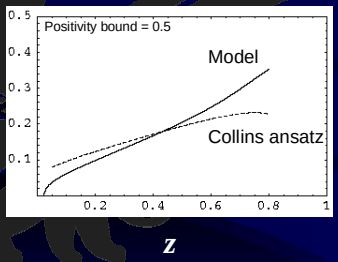


The ratio with D_1 does not depend strongly on μ^2

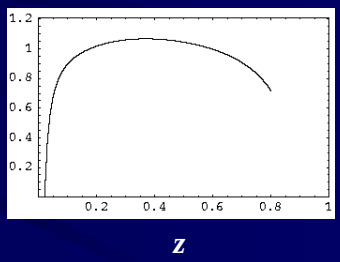
The dependence on the constituent quark mass and on the coupling constant is weak

Results for moments of the Collins function

$H_1^{\perp(1/2)}(z) / D_1(z)$

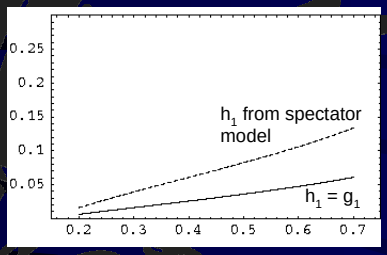


$H_1^{\perp(1)}(z) / D_1(z)$



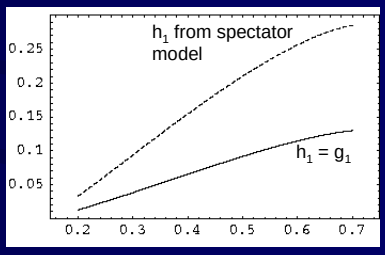
Results for the asymmetries

$A_T \left\langle \sin(\phi_h + \phi_S) \right\rangle$



Non-weighted asymmetry, with assumption on intrinsic transverse momentum

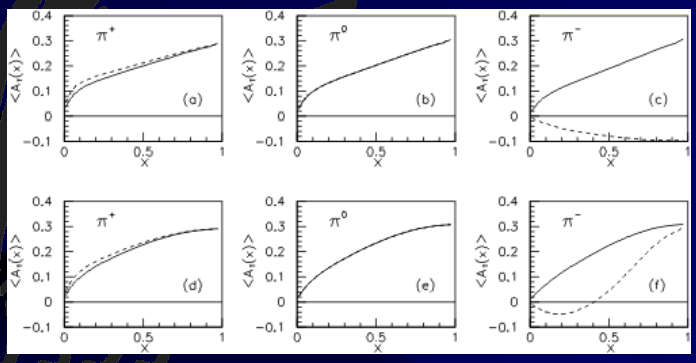
$A_T \left\langle \left| \vec{P}_{h\perp} \right| / M_h \sin(\phi_h + \phi_S) \right\rangle$



Weighted asymmetry

A different estimate

$A_T \left\langle \left| \vec{P}_{h\perp} \right| / M_h \sin(\phi_h + \phi_S) \right\rangle$



Diquark model

pQCD based analysis

B.-Q. Ma, I. Schmidt, J.-J. Tang, hep-ph/0110324, to appear in PRD

Summary of Collins function

- It seems to be a very nice tool to probe transversity.
- Estimates suggest a 10%-25% effect.
- The weighted asymmetry is theoretically preferable to the non-weighted one.
- The evolution of this function is under study.

Two-hadrons transverse spin asymmetries

$$A_T = \frac{d^7\sigma^{\uparrow} - d^7\sigma^{\downarrow}}{d^7\sigma^{\uparrow} + d^7\sigma^{\downarrow}}$$

$$d^7\sigma = \frac{d^7\sigma}{dx\,dy\,dz\,dM^2\,d\theta_R\,d\phi_R\,d\phi_S}$$