MC studies for flavour extractions with proton target

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Outline

- Motivation
- Remark on how PQD can be measured
- Estimation of asymmetries on proton target
- What we can gain on PQD
- conclusions

Motivation

Predictions for flavour helicity distributions assuming COMPASS runnig on longitudinally polarized proton target (distant future ≥ 2007)

Reminder of the method

$$\vec{A} = \left(A_1^d , A_{1,h+}^d , A_{1,h-}^d , A_1^p , A_{1,h+}^p , A_{1,h-}^p \right)$$

COMPASS

?

QPM:

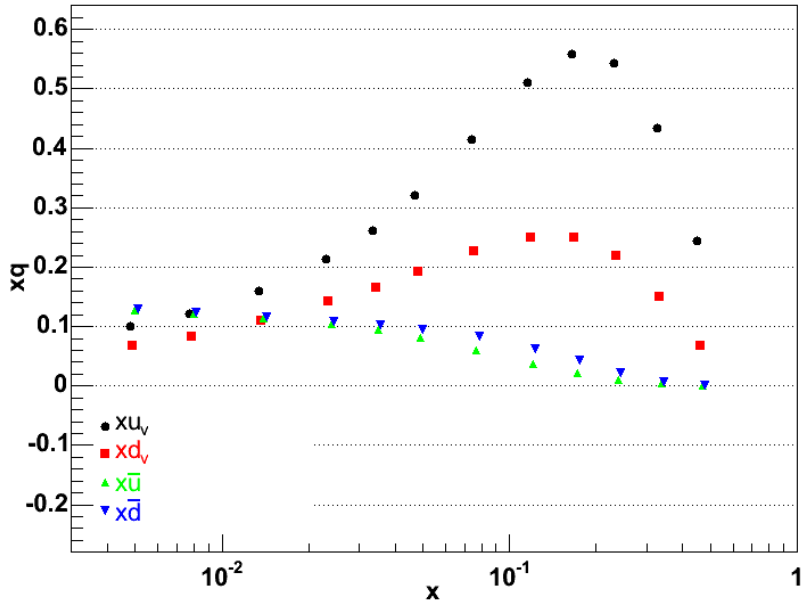
$$A_1^h(x) = \frac{\sum_{i,h} e_i^2 \left[\Delta q_i(x) D_i^h + \Delta \bar{q}_i(x) D_i^h \right]}{\sum_{i,h} e_i^2 \left[q_i(x) D_i^h + \bar{q}_i(x) D_{\bar{q}}^h \right]}$$

$$\chi^2 = \left(\vec{A}_{data} - \vec{A}_{calc} \right) cov^{-1} \left(\vec{A}_{data} - \vec{A}_{calc} \right)^T$$

Account for full covariance matrix

Parametrization

- Unpolarized distributions – MRST (2004,LO)
  (points at COMPASS measured avarage Q^2 in each x bin).



- Fragmentation functions integrated over z from 0.2 to 1
  (assumptions needed)

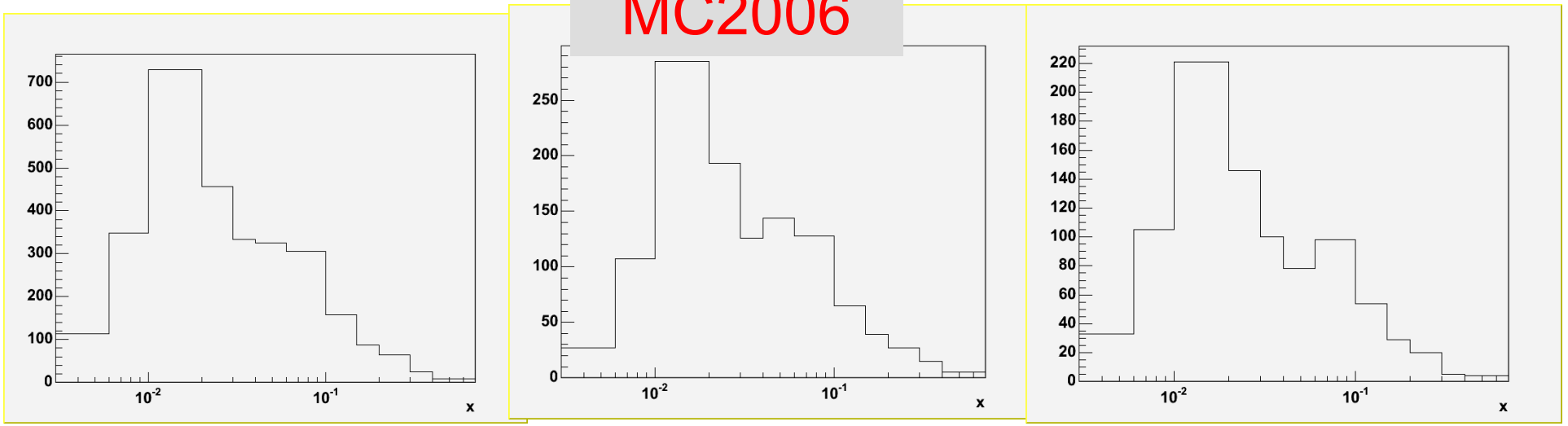
MC

- Two Comgeant MC's were generated and reconstructed with CORAL.
  - 2006 setup
  - 2004 setup (for reference)

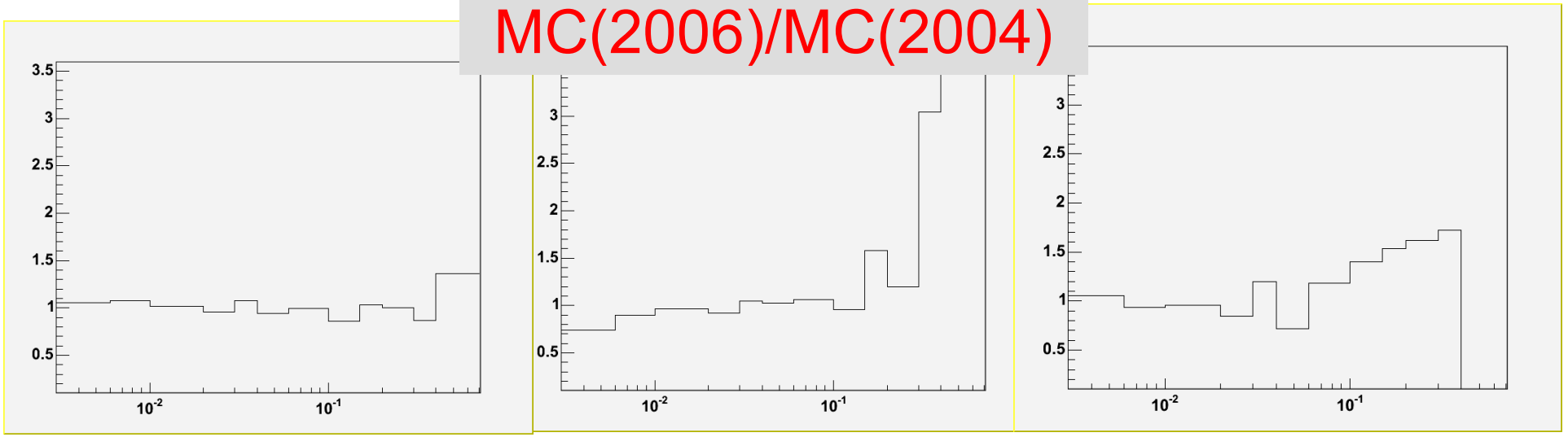
  Final samples consist of 8000 events each.

x distributions

MC2006



MC(2006)/MC(2004)



MC

- 2006 MC x distibutions were scaled to about half of statitistics of real data in 2004 (~30M events).

- SMC asymmetries on protons were used with
  - scaled errors

$$\Delta A_{estimated} \propto \frac{1}{P_B D P_{Tp} f_p} \frac{1}{\sqrt{N}}$$

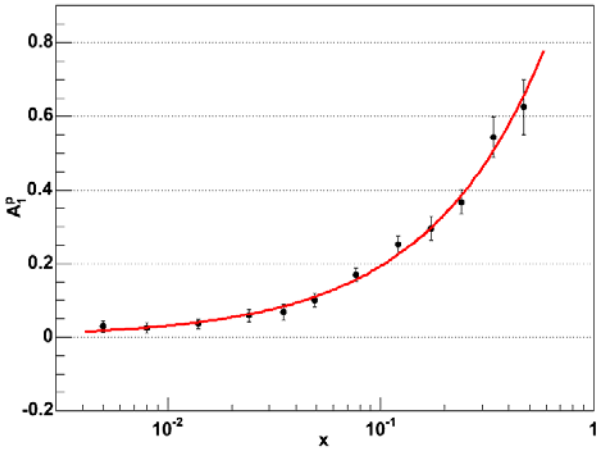
  - and reduced fluctuations

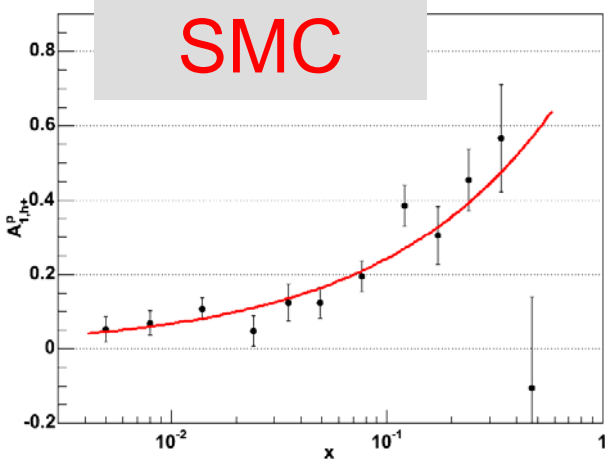
$$A_{estimated} = \frac{A_{SMC} - fit}{\Delta A_{SMC}} \Delta A_{estimated} + fit \qquad fit = Ax^B$$

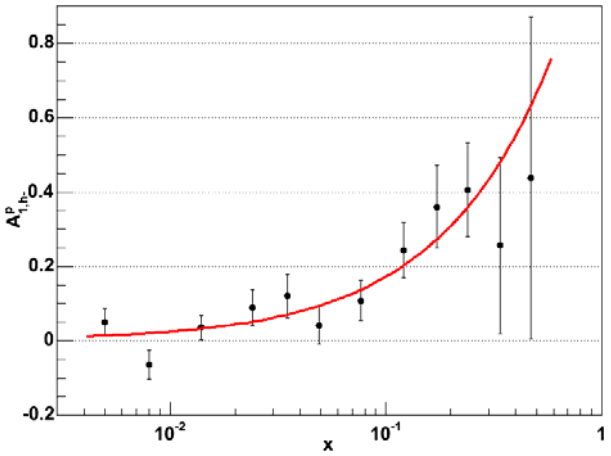
  - correlations left unchanged

Asymmetries

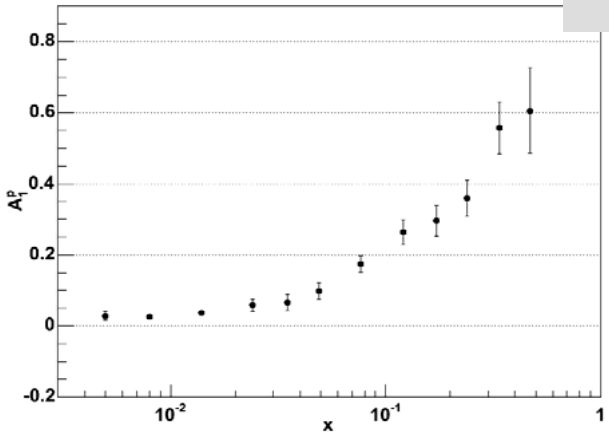
SMC

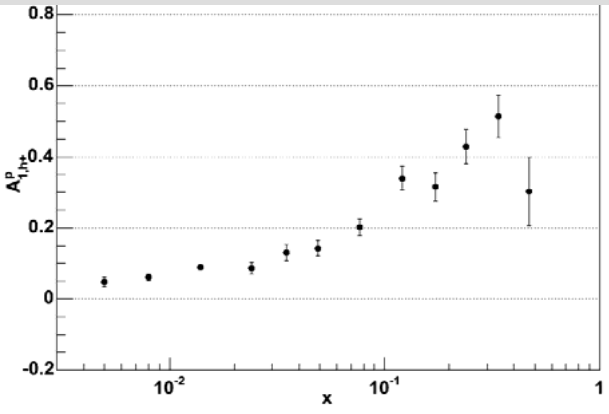


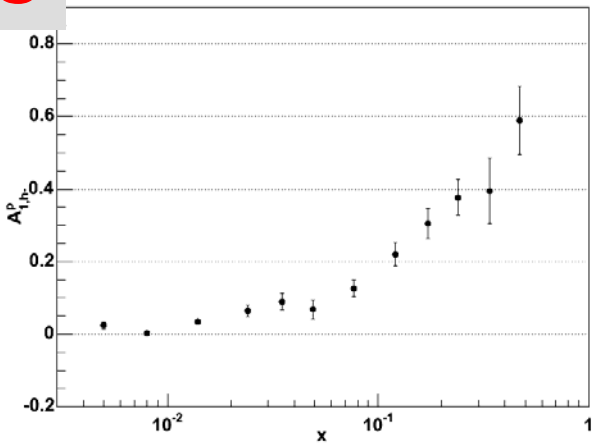




~half year COMPASS



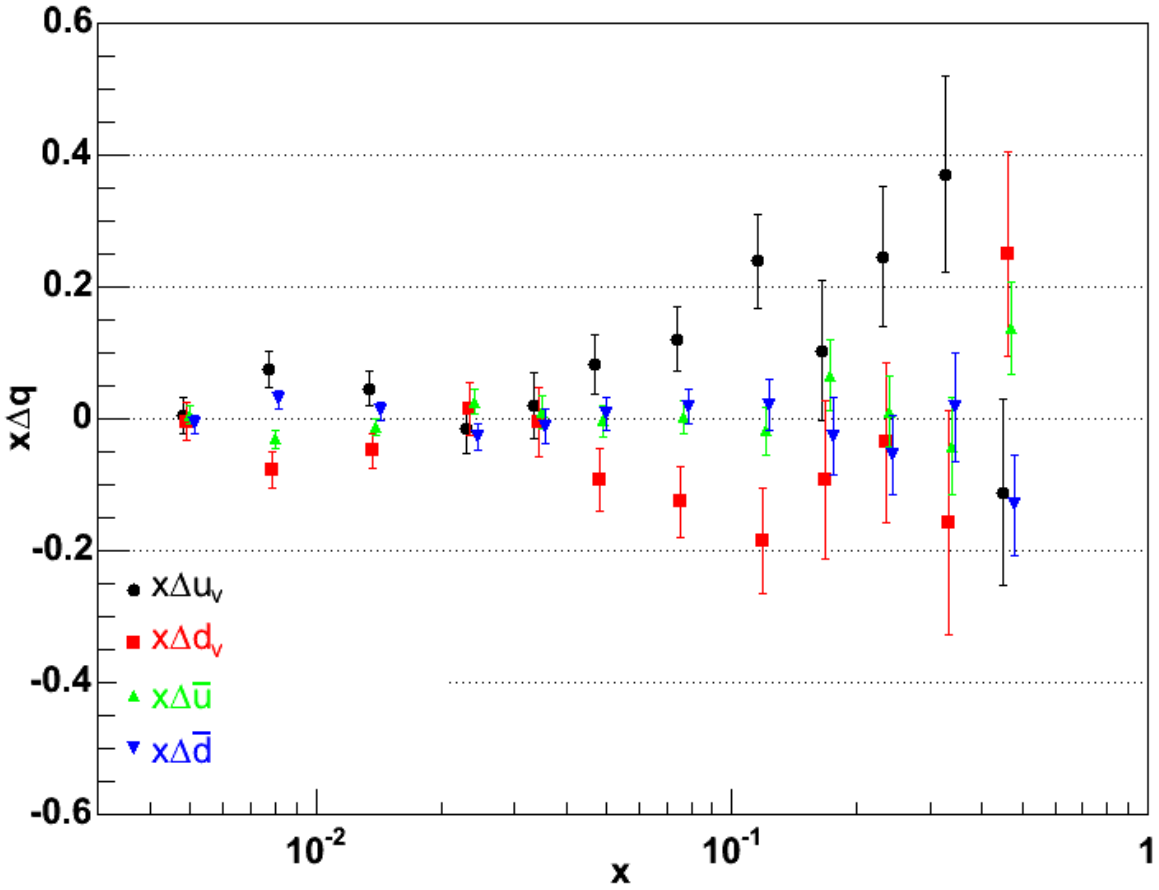




PQD

What we have

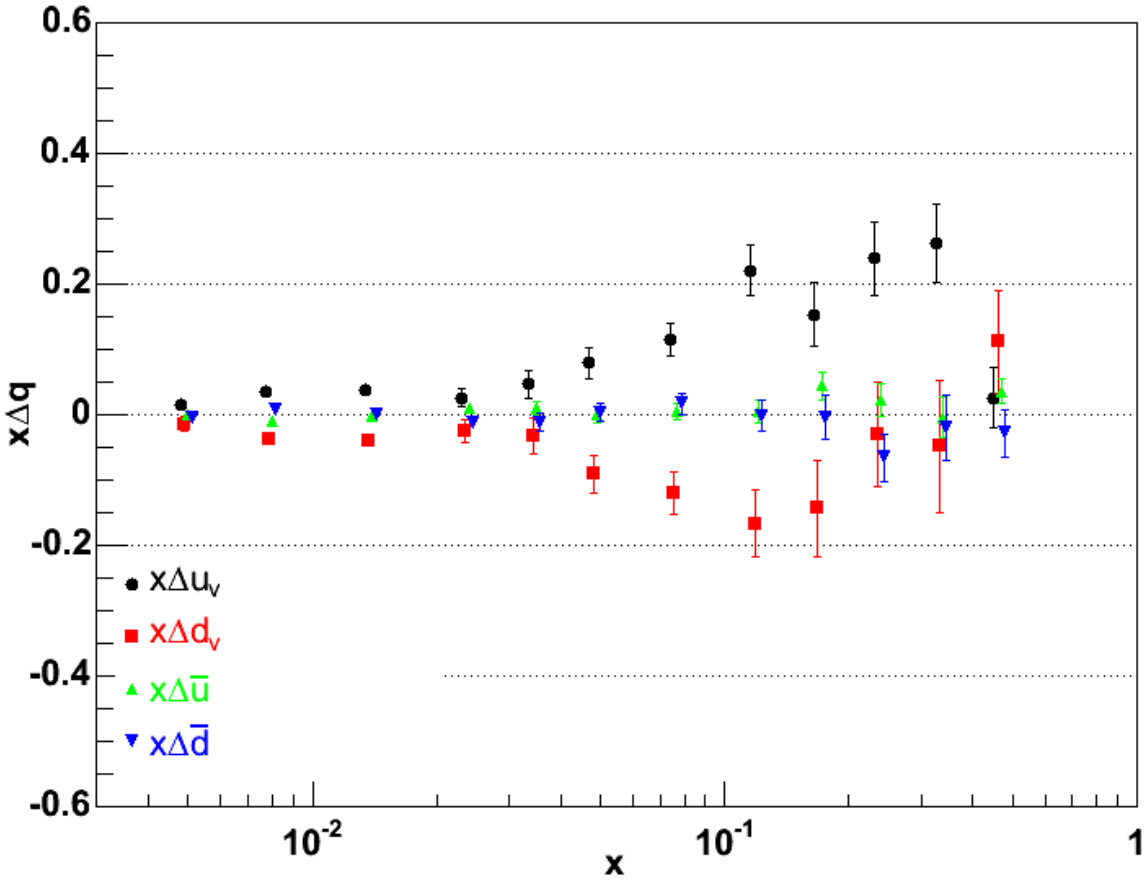
(COMPASS deuteron + SMC proton)



PQD

What we can have

(COMPASS deuteron + (~half year) COMPASS proton)



x-Integrals of PQD in measured region

COMPASS+SMC

$$\int \Delta u_v = 0.44 \pm 0.13$$

$$\int \Delta d_v = -0.17 \pm 0.14$$

$$\int \Delta \bar{u} = 0.09 \pm 0.06$$

$$\int \Delta \bar{d} = -0.08 \pm 0.07$$

Future?

$$\int \Delta u_v = 0.5 \pm 0.05$$

$$\int \Delta d_v = -0.24 \pm 0.08$$

$$\int \Delta \bar{u} = 0.06 \pm 0.02$$

$$\int \Delta \bar{d} = -0.04 \pm 0.04$$

Conclusions

- 2.5x improvement on Δu_v
- 3 x improvement on $\Delta \bar{u}$
- Also significant but less pronounced improvement on d quarks