

# DIS 2007

April 16-20, 2007, Munich, Germany



XV International Workshop on Deep-Inelastic Scattering and Related Subjects

## Summary of the Spin Physics session

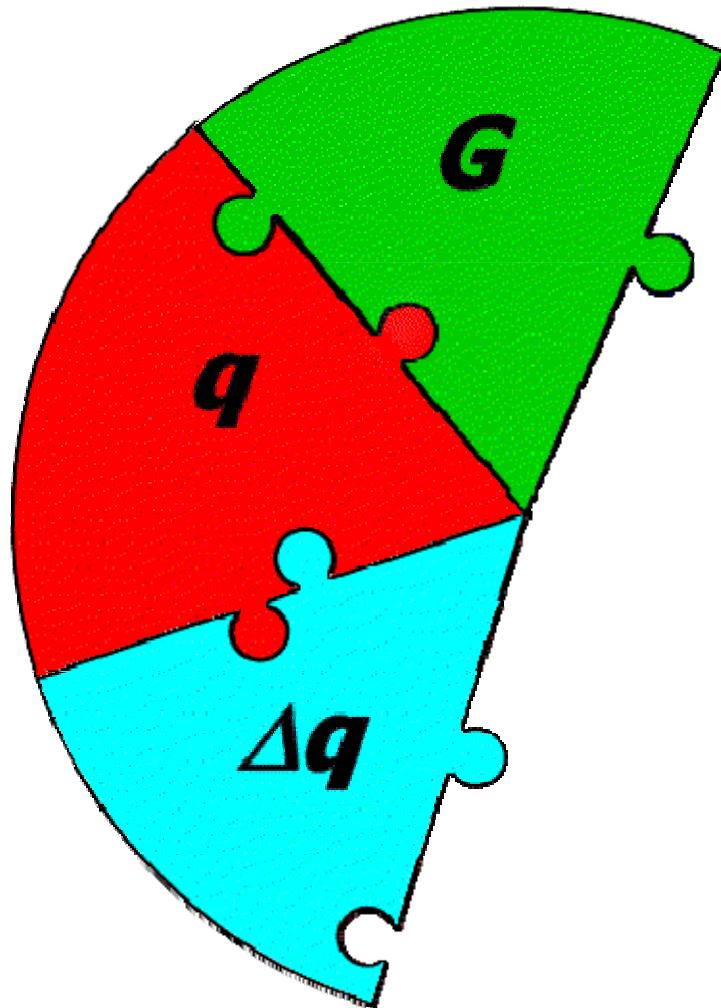
-- experimental part --

**Delia Hasch**

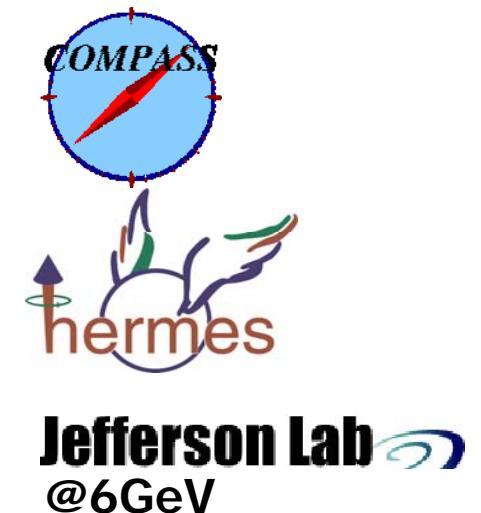


# (spin) structure of the nucleon

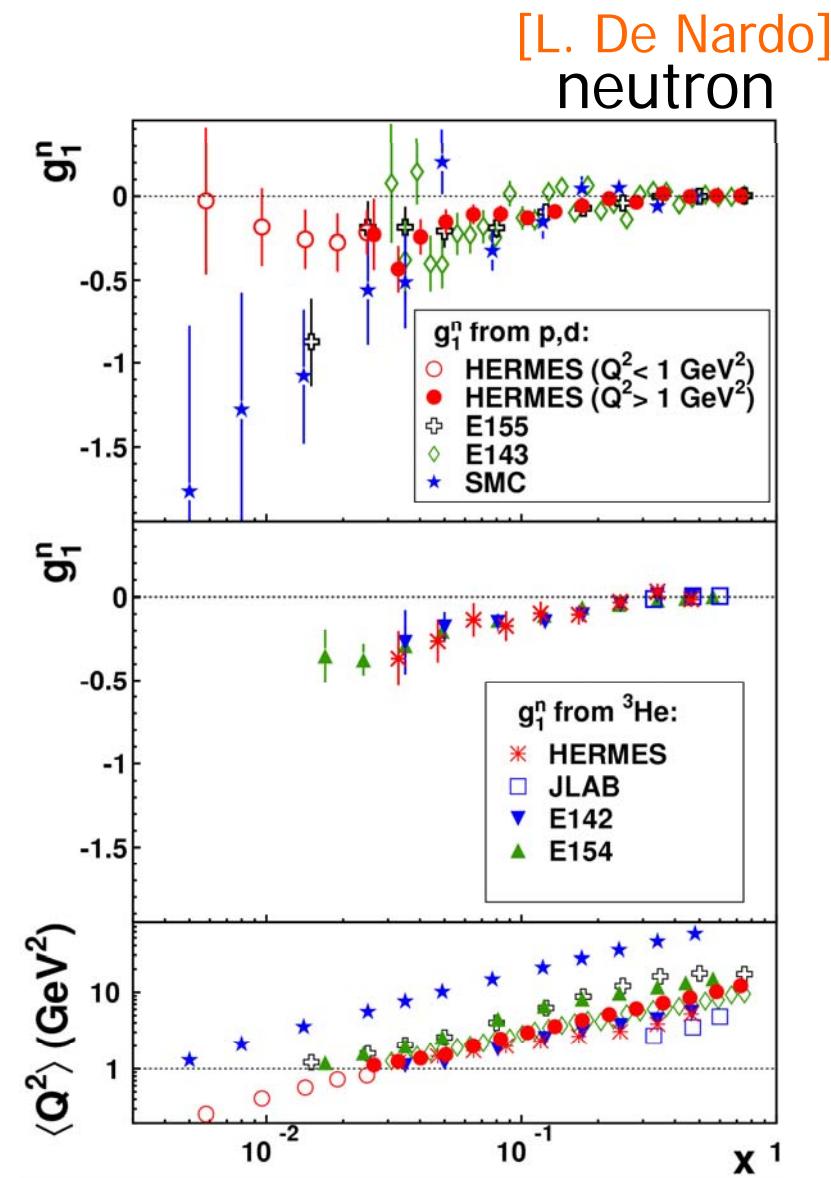
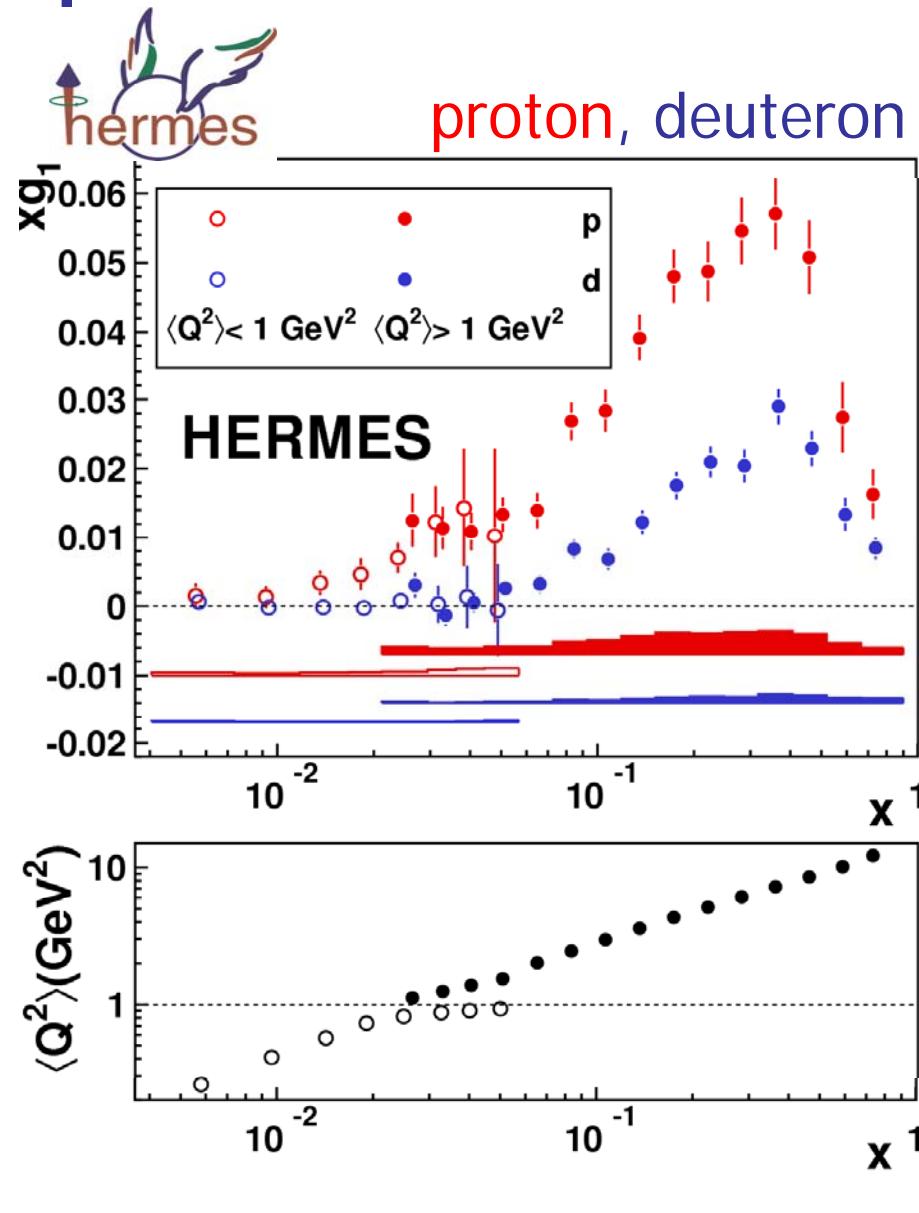
*" You think you understand something? Now add spin..." -- R. Jaffe*



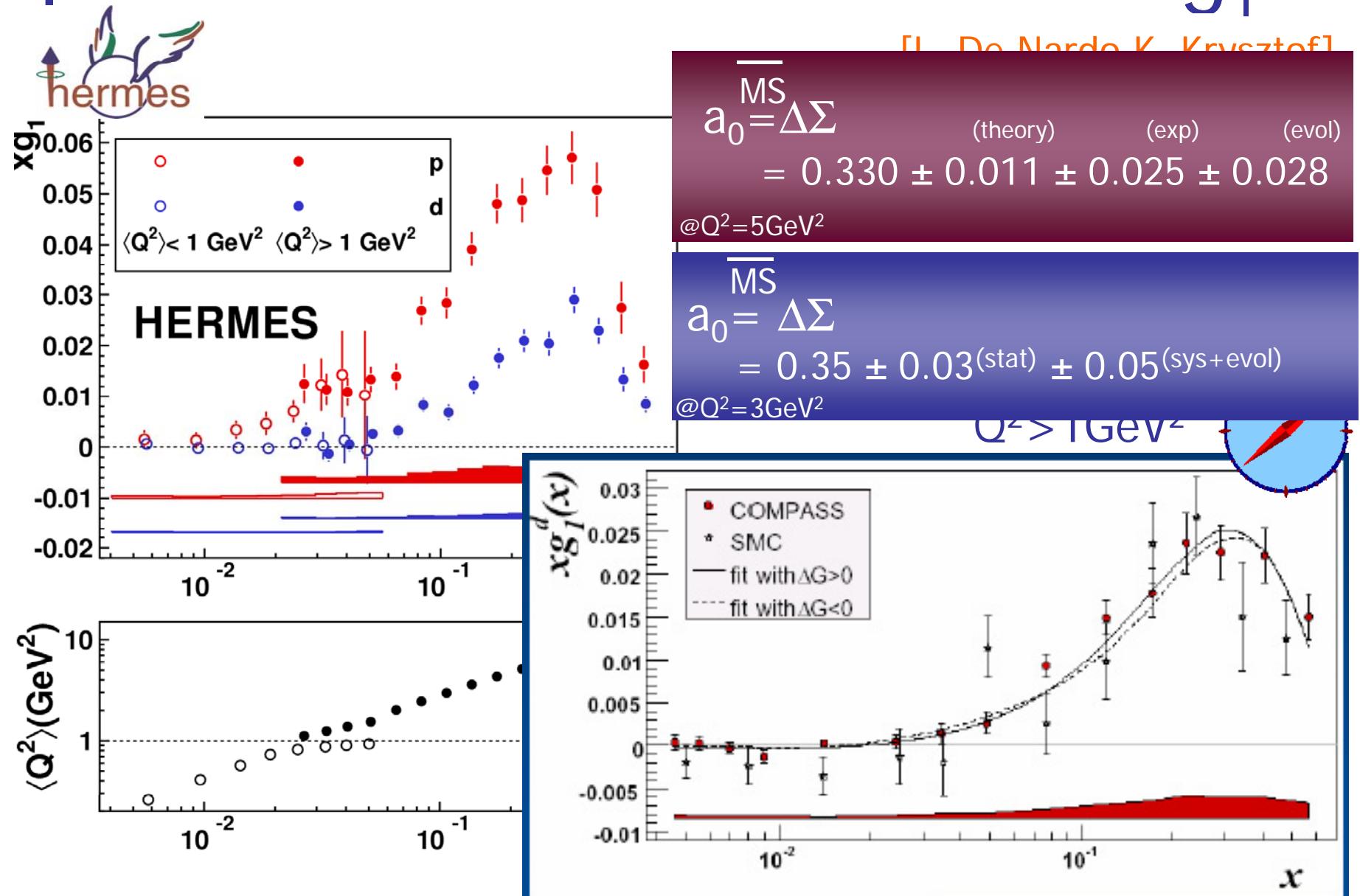
K. Krysztof  
A. Korzenev  
L. De Nardo  
K. Griffion  
P. Cole  
K. Slifer



# polarised structure functions: $g_1$



# polarised structure functions: $g_1$

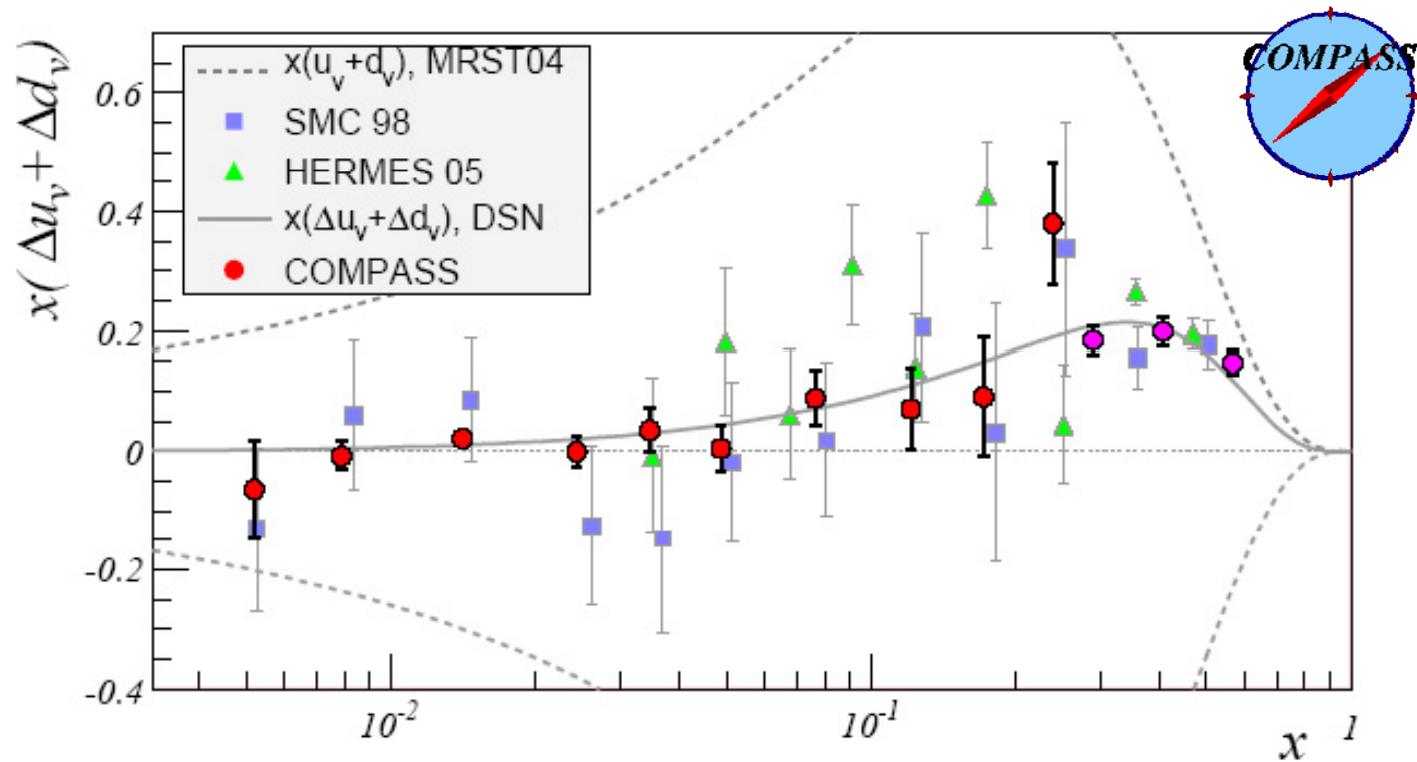


# helicity distributions

[A. Korzenev]

valence quark distributions:  $\Delta u_v + \Delta d_v$

from *semi-inclusive* difference asymmetry:  $A_d^{h^+ - h^-}(x) = \frac{\Delta u_v(x) + \Delta d_v(x)}{u_v(x) + d_v(x)}$

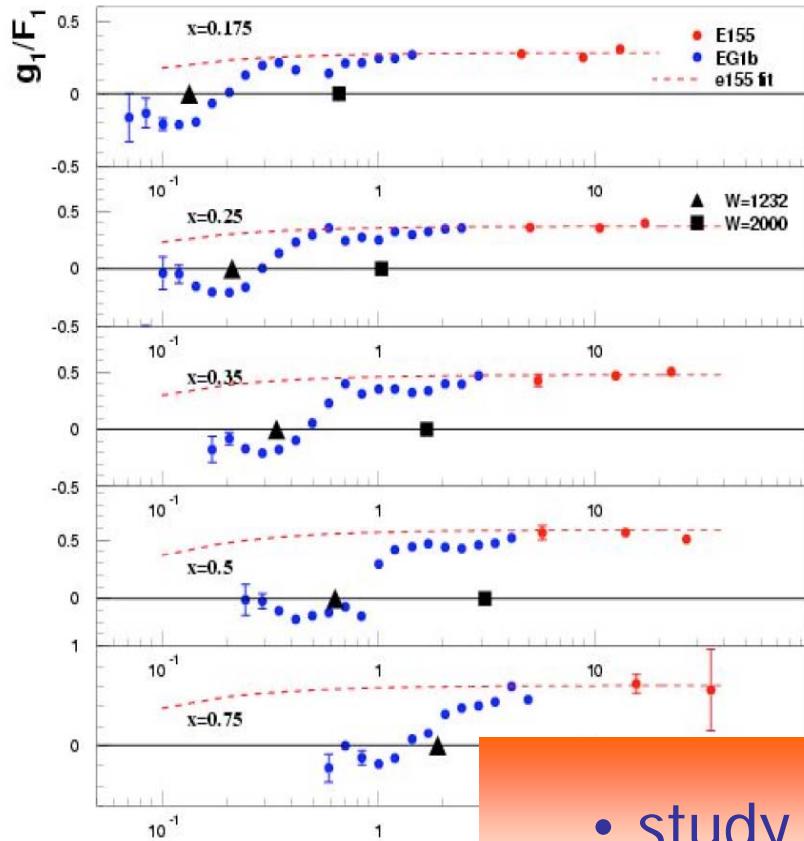


first SIDIS result from COMPASS!

# spin structure

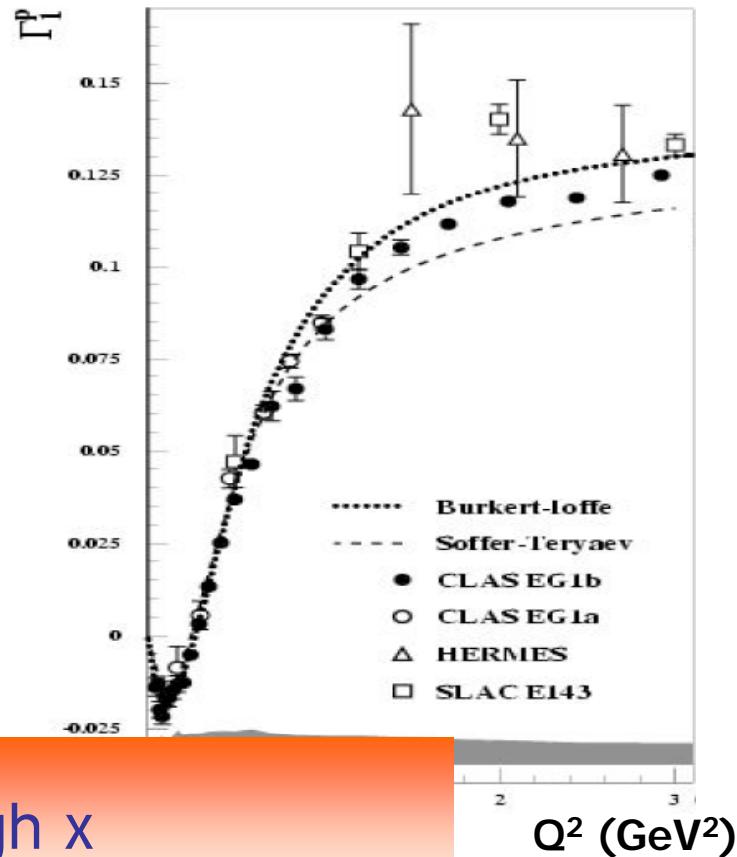
[K. Griffion, K. Slifer]

- resonance region

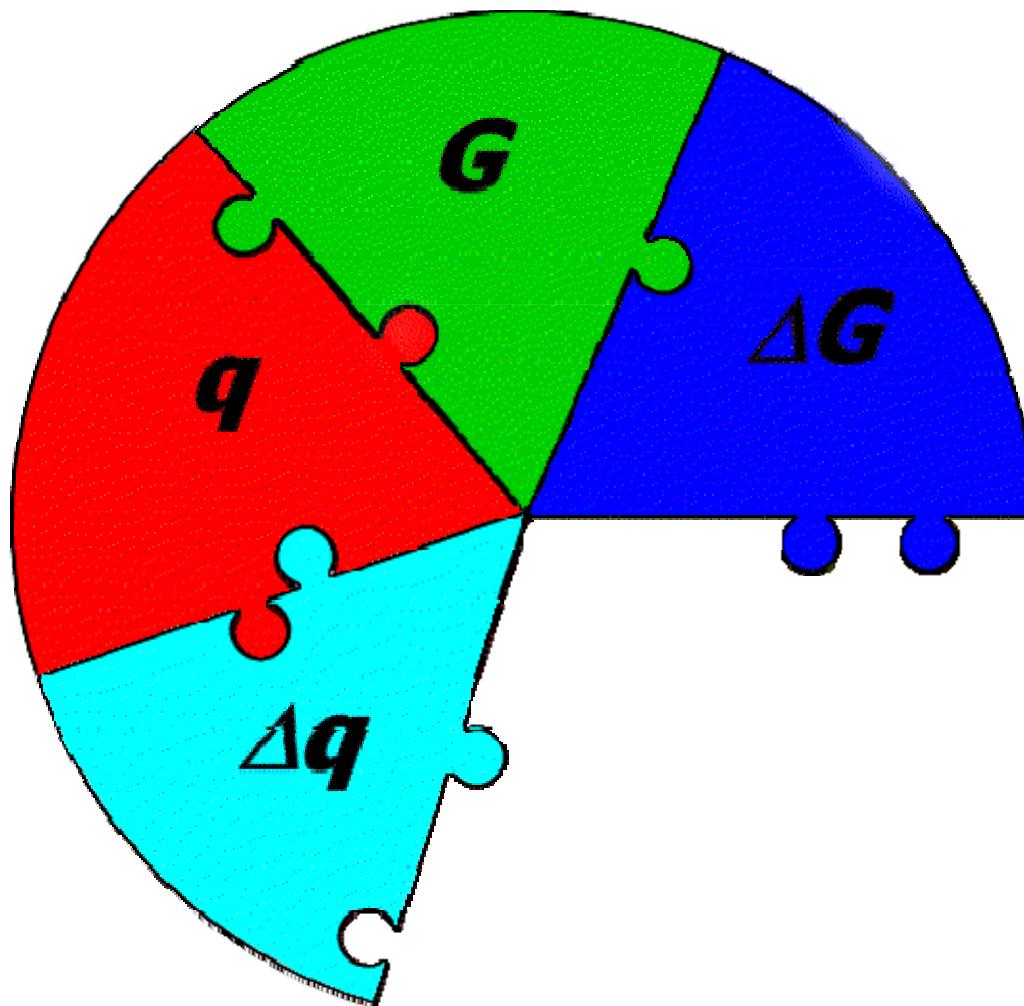


- study of high  $x$
- prove of duality
- determination of HT ...

- GDH SR



# (spin) structure of the nucleon



P. Liebing



S. Koblitz



K. Okada



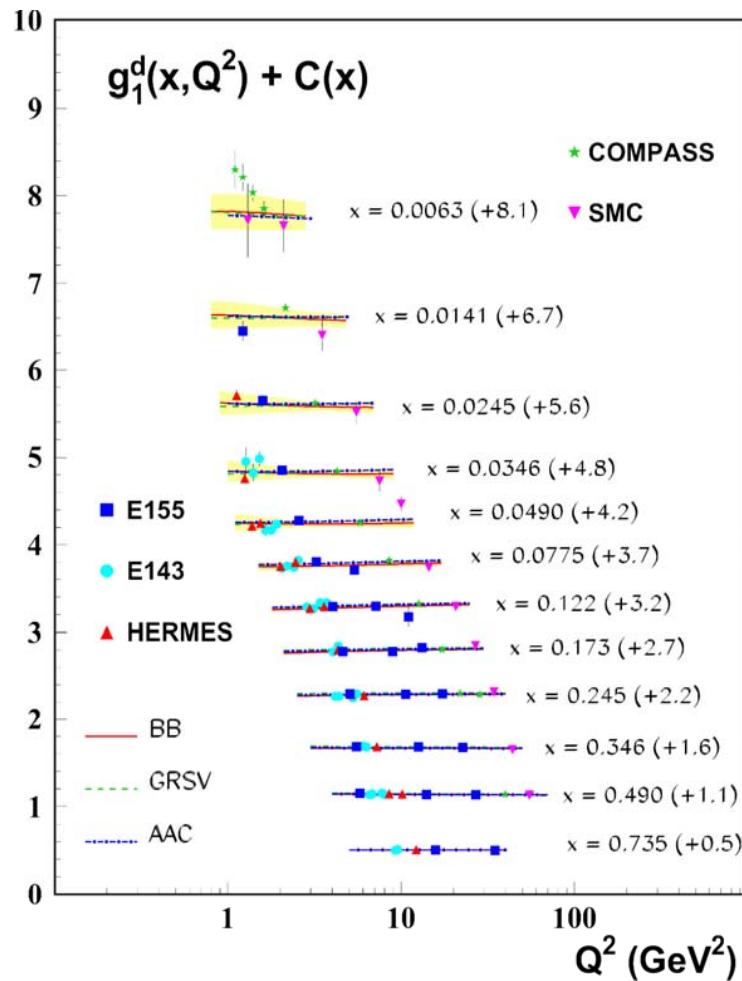
R. Fatemi



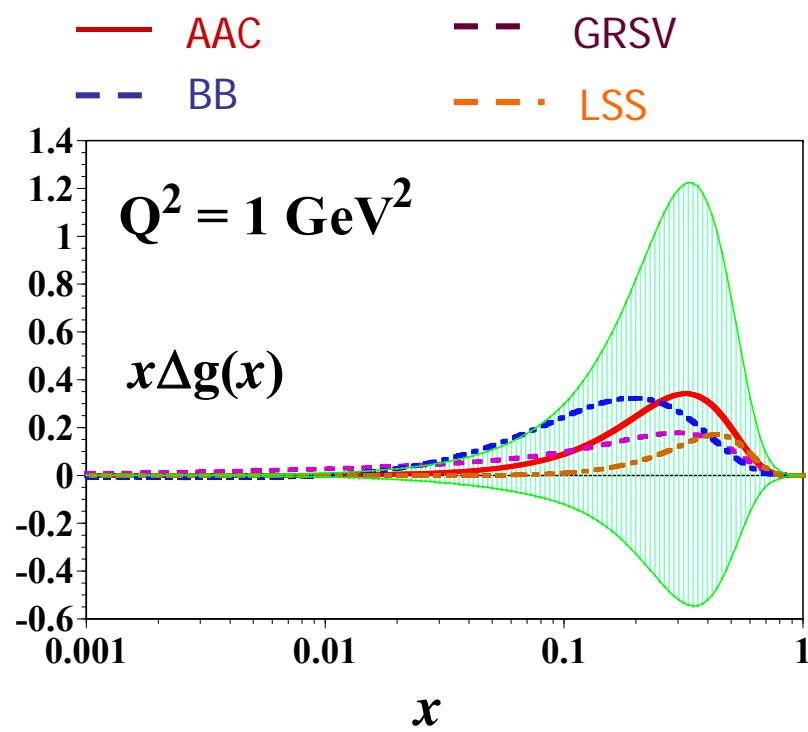
F. Simon

J. Lajoie

# gluon polarisation



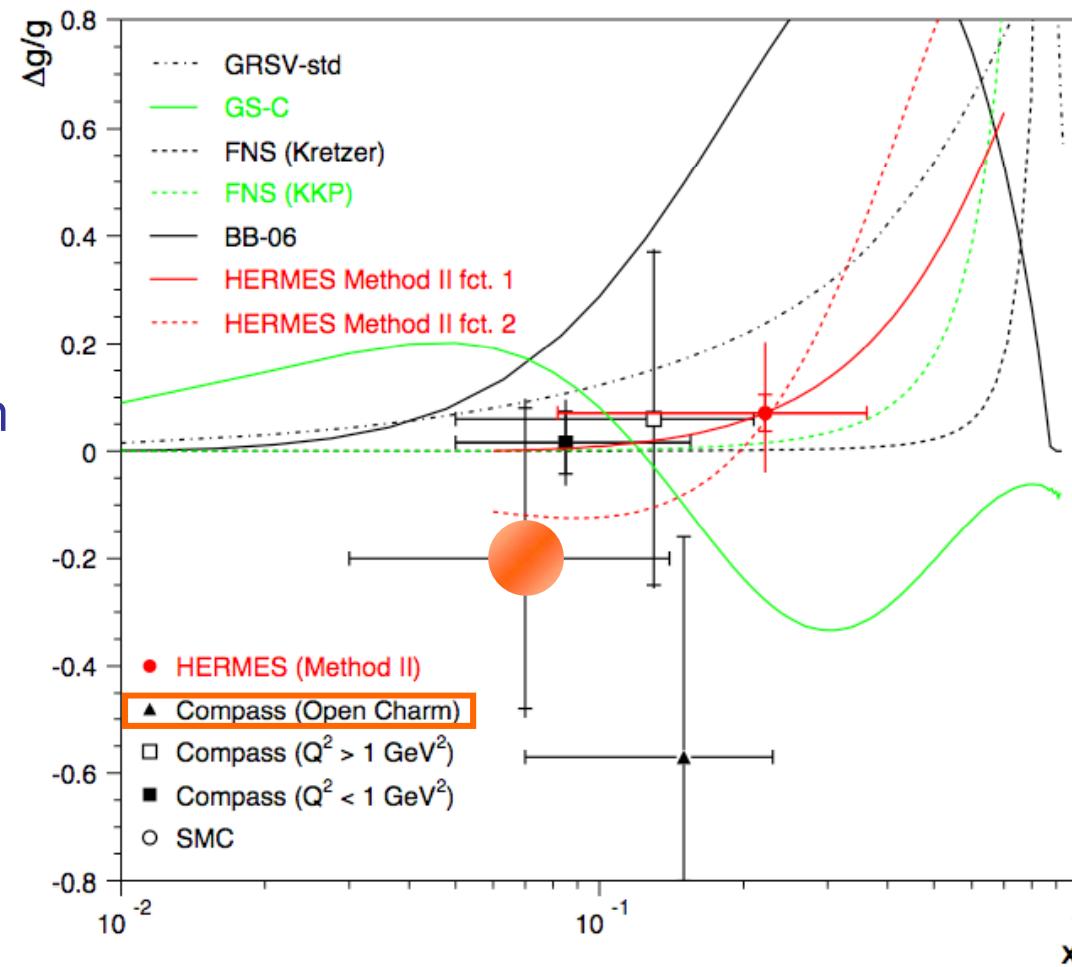
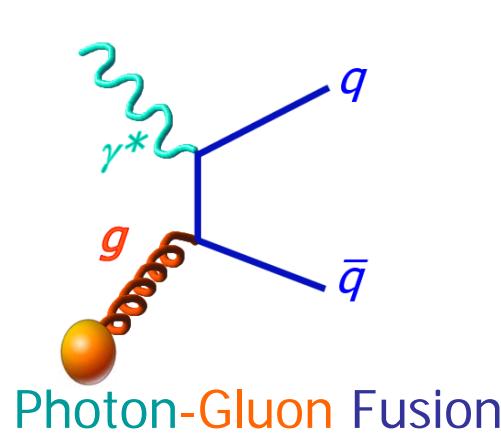
from scaling violation:



# gluon polarisation

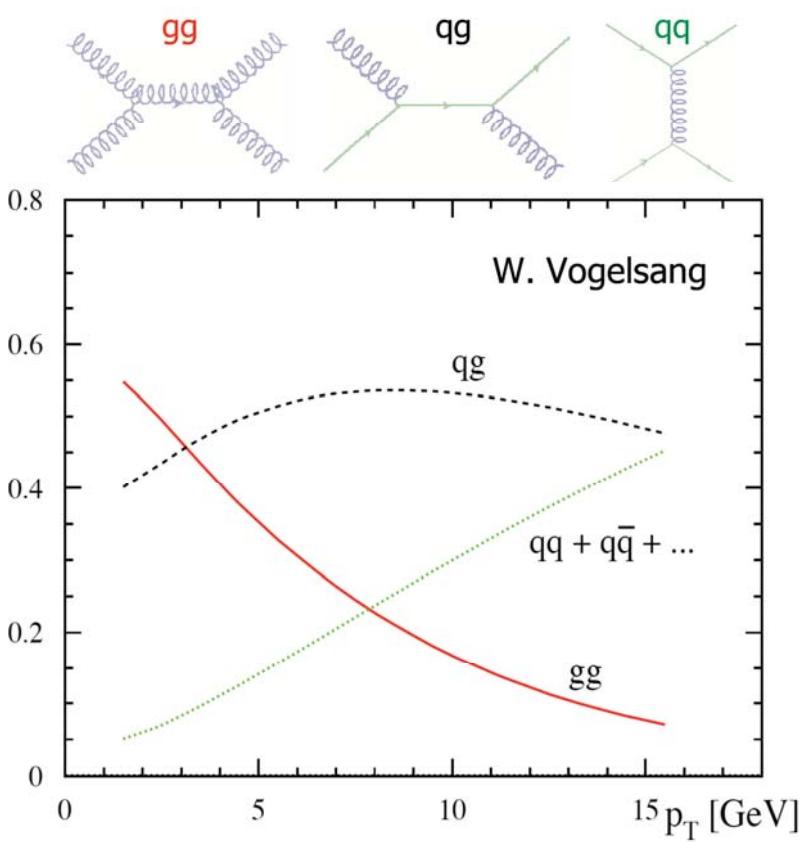
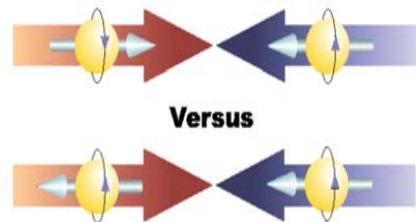
[P. Liebing, S. Koblitz]

"direct" measurements:



# gluon polarisation

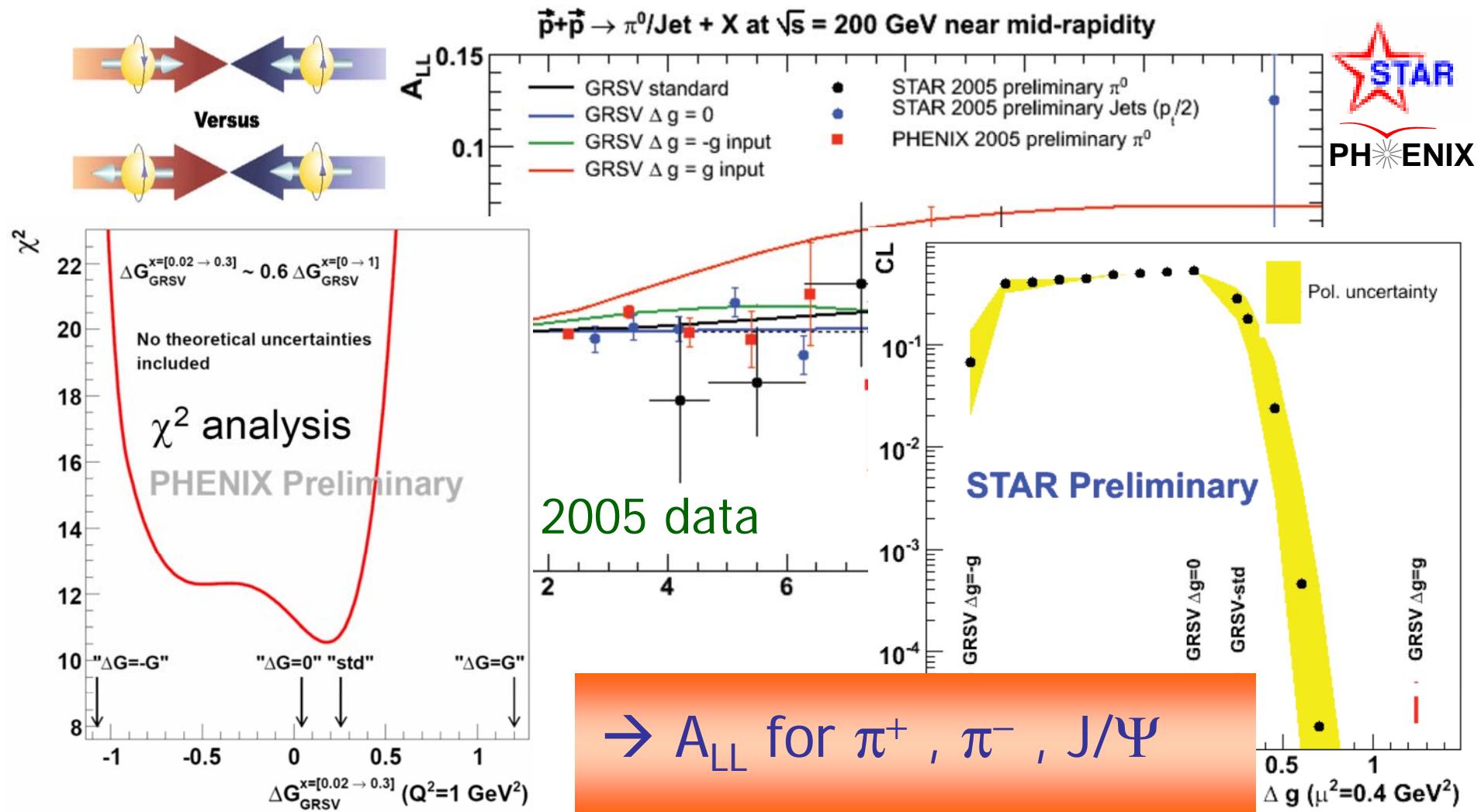
"direct" measurements: polarised pp @RHIC :



# gluon polarisation

[K. Okada, R. Fatemi, F. Simon]

"direct" measurements: polarised pp @RHIC :

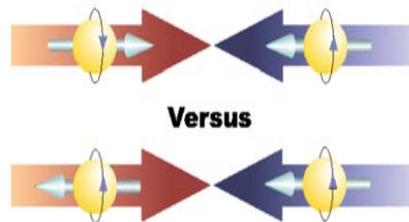


# gluon polarisation

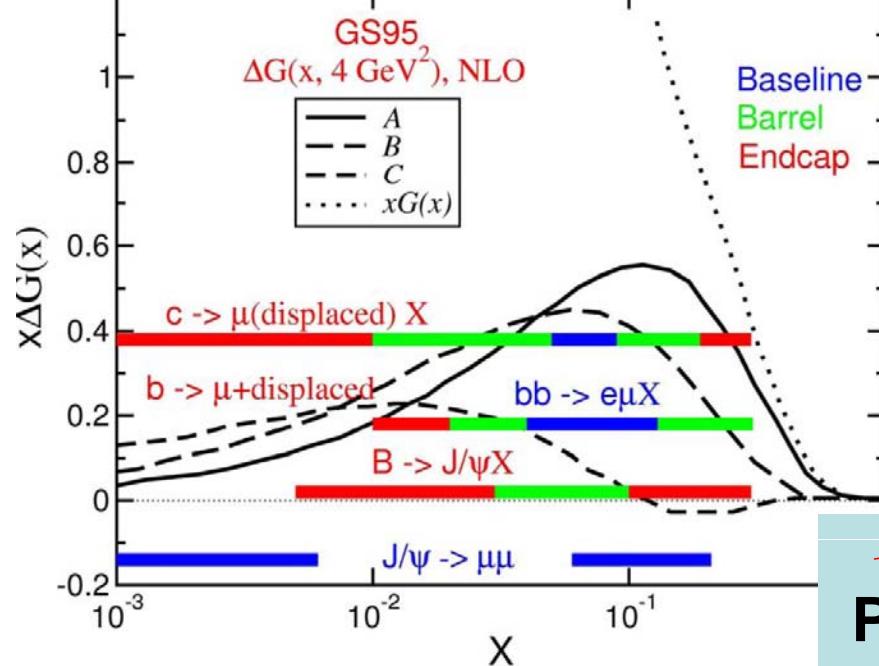
[K. Okada, R. Fatemi, F. Simon, J. Lajoie]

"direct" measurements: polarised pp @RHIC

**FUTURE:**



→ 2006: 7.5 pb<sup>-1</sup> @60% polarisation

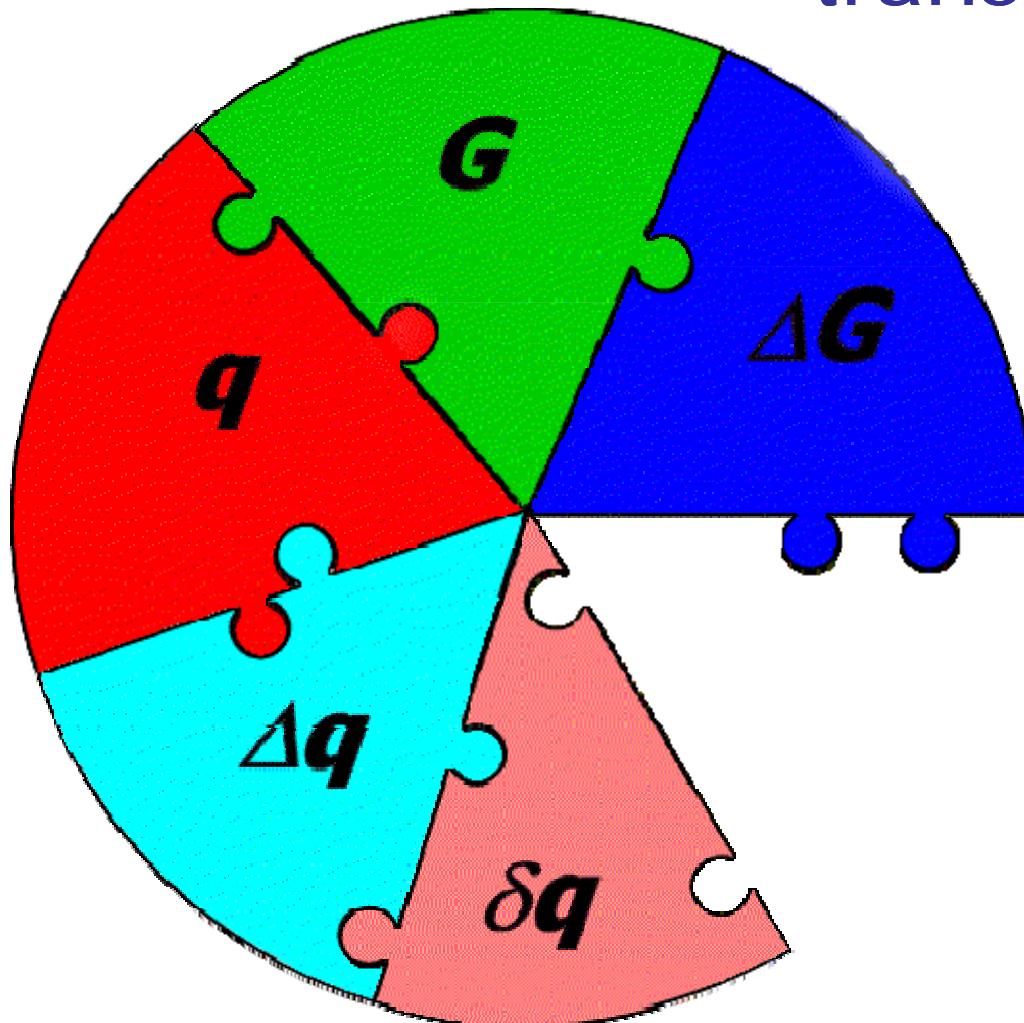


projections



# (spin) structure of the nucleon

transversity&friends



R. Seidl



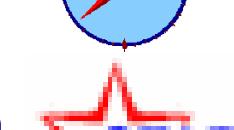
M. Diefenthaler



A. Bressan



U. D'Alesio



O. Eyser



S. Heppelmann



J. Lee



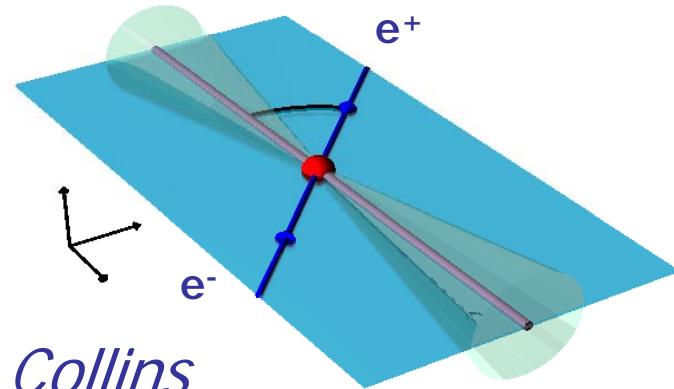
J. Balitsky

C. Schill

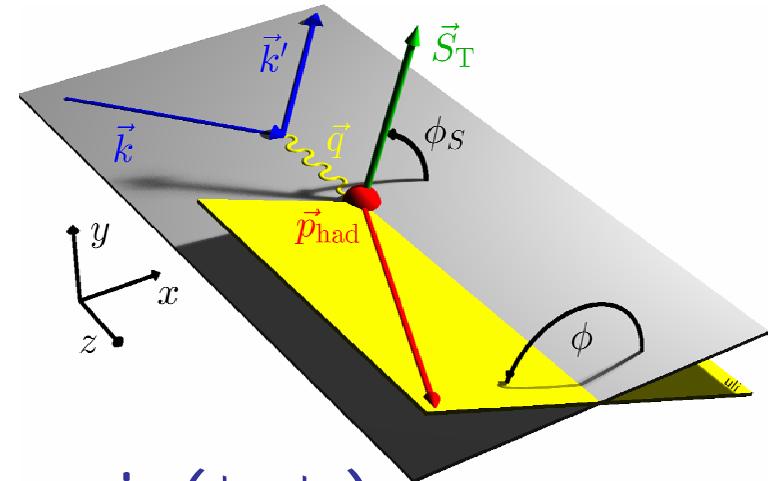
A. Kotzinian

# *first glimpse* of transversity

global fit of data from BELLE( $FF$ ), HERMES and COMPASS( $DF \times FF$ )



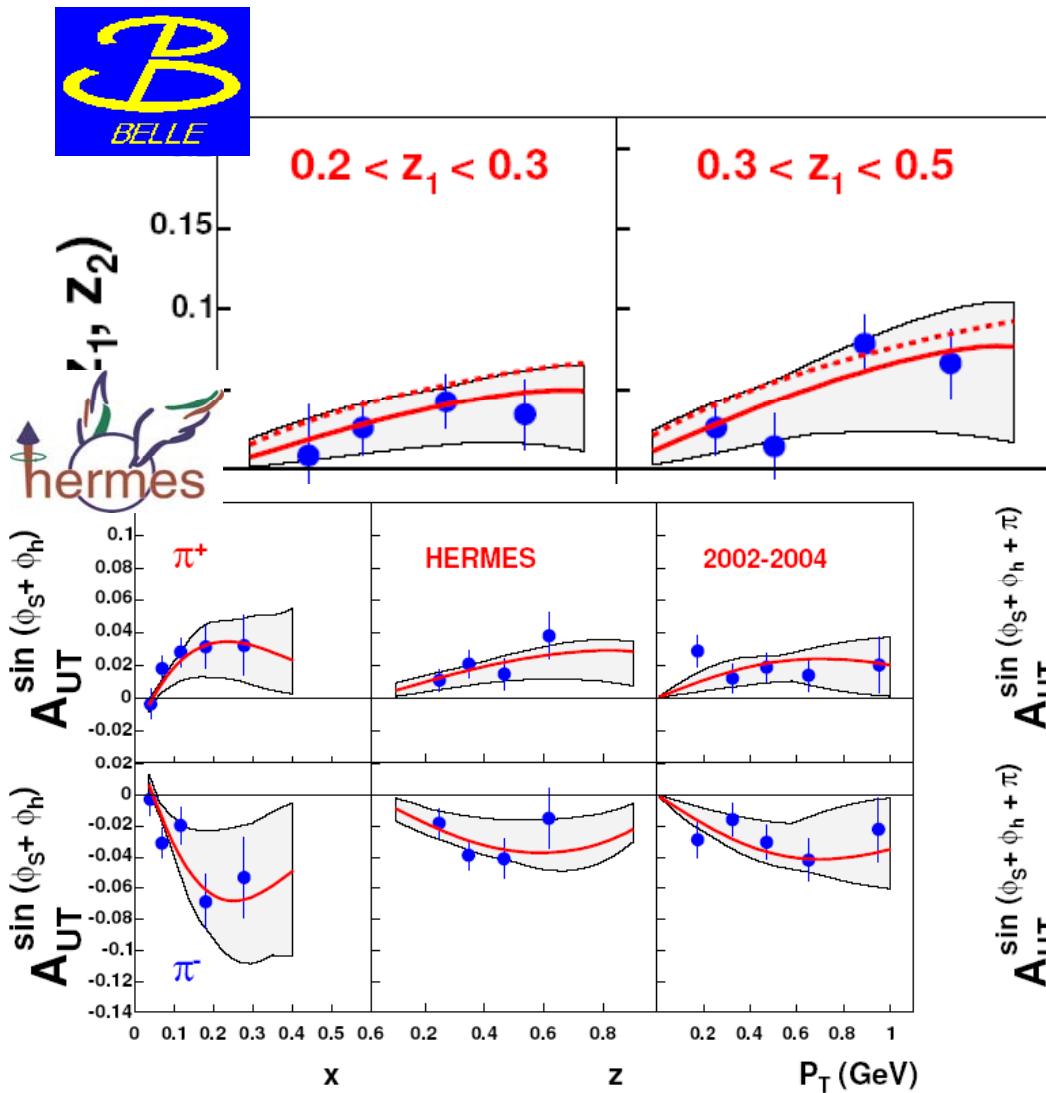
*Collins  
fragmentation function*



$$A_{UT} \sin(\phi + \phi_S)$$

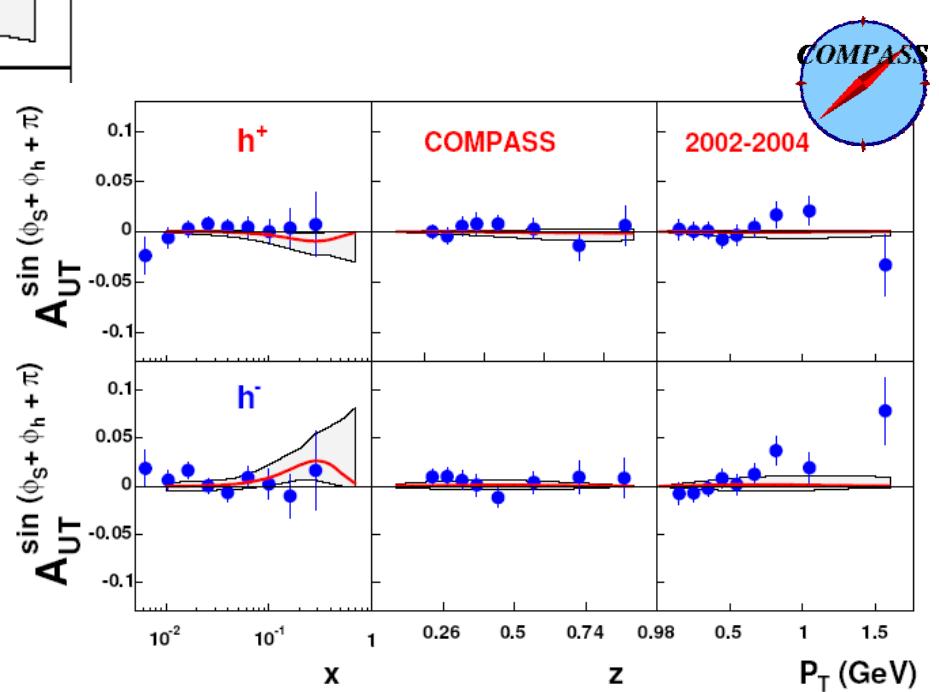
# *first glimpse of transversity*

global fit of data from BELLE(*FF*), HERMES and COMPASS(*DF $\times$ FF*)



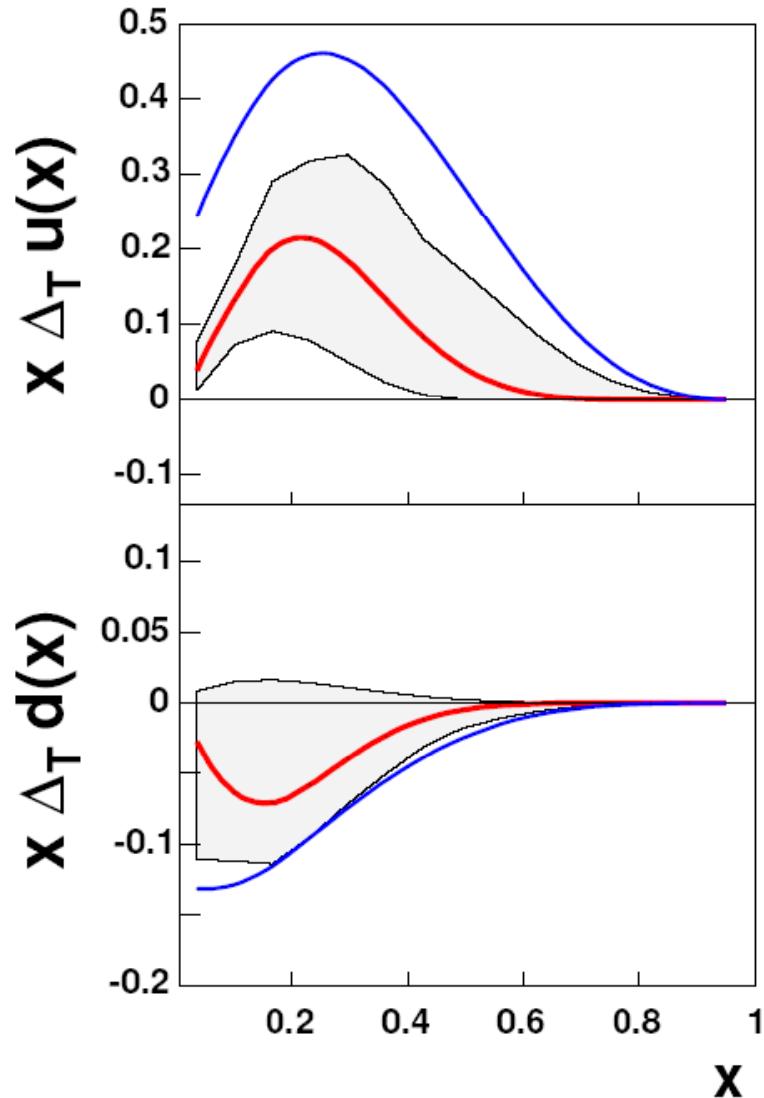
*Collins  
fragmentation function*

[U. D'Alesio]



# *first glimpse* of transversity

global fit of data from BELLE( $FF$ ), HERMES and COMPASS( $DF \times FF$ )



[U. D'Alesio]

new data:

[R. Seidl, M. Diefenthaler, A. Bressan]



$29 \text{ fb}^{-1} \rightarrow 547 \text{ fb}^{-1}$



full data set with  
transv. target:

$\pi^{+/-/0}, K^{+/-}$



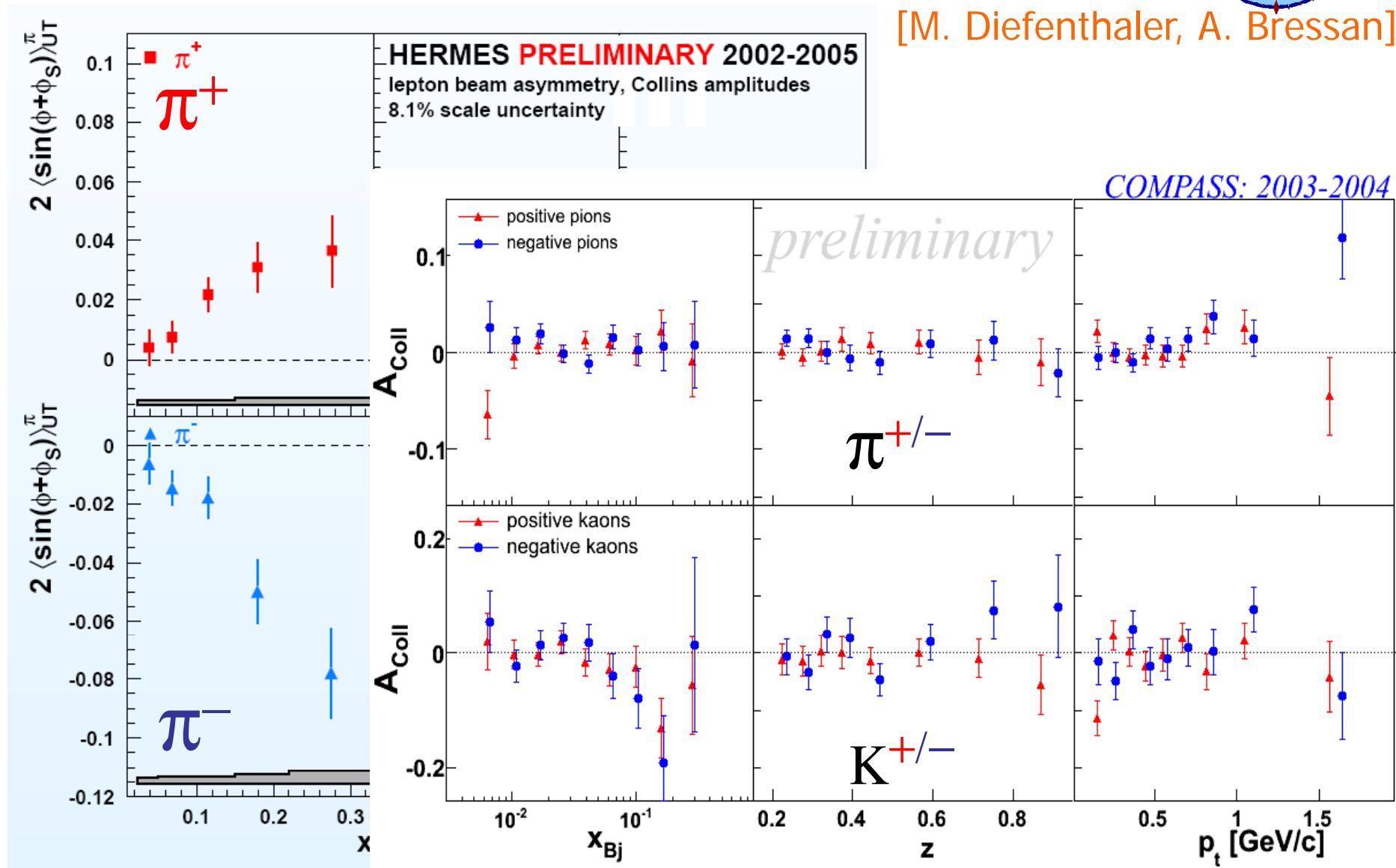
$\pi^{+/-}, K^{+/-}$



# transversity



[M. Diefenthaler, A. Bressan]



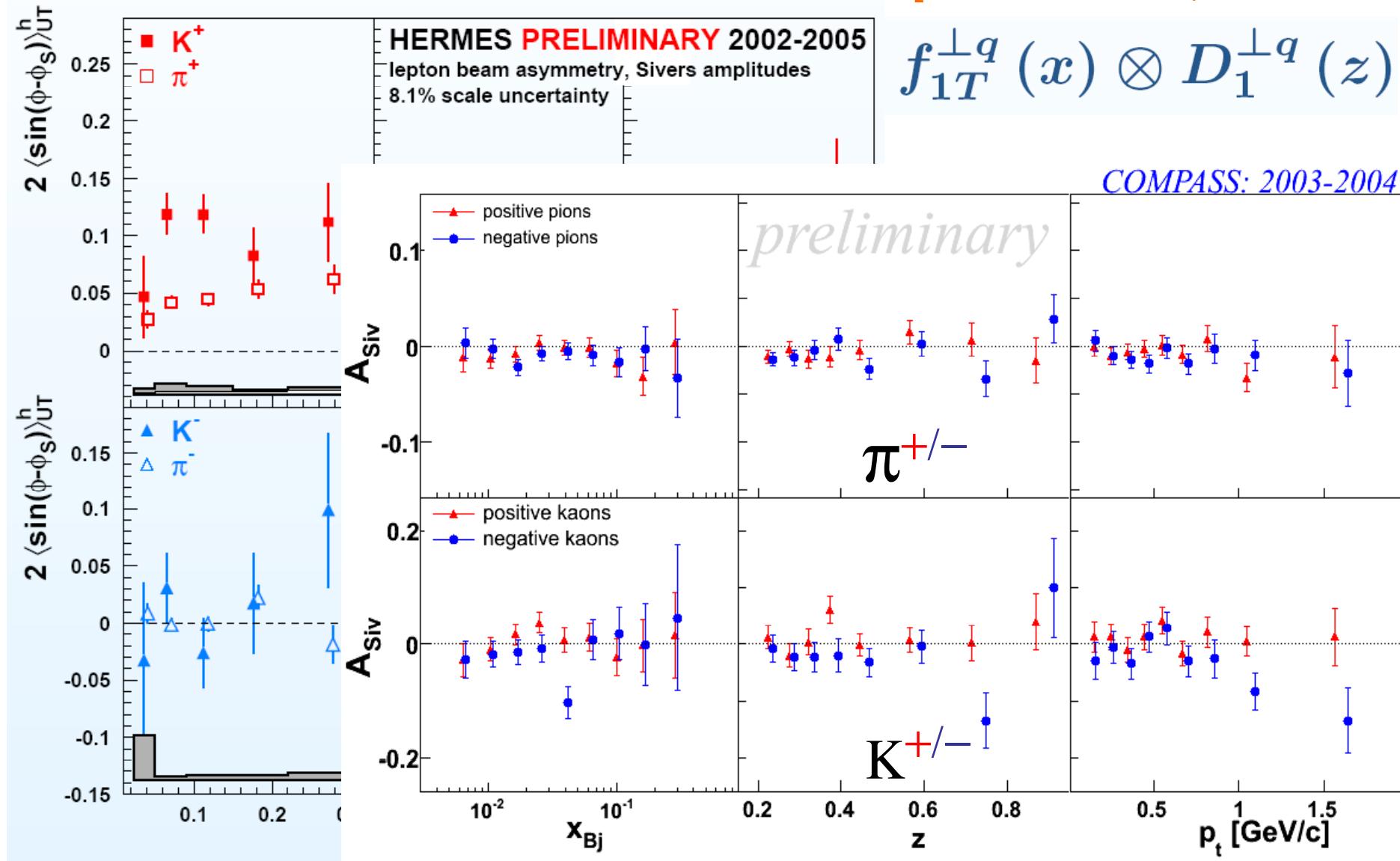


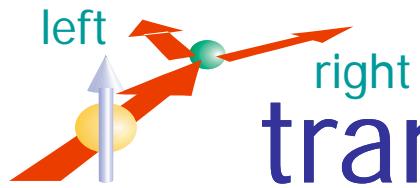
# Sivers



[M. Diefenthaler, A. Bressan]

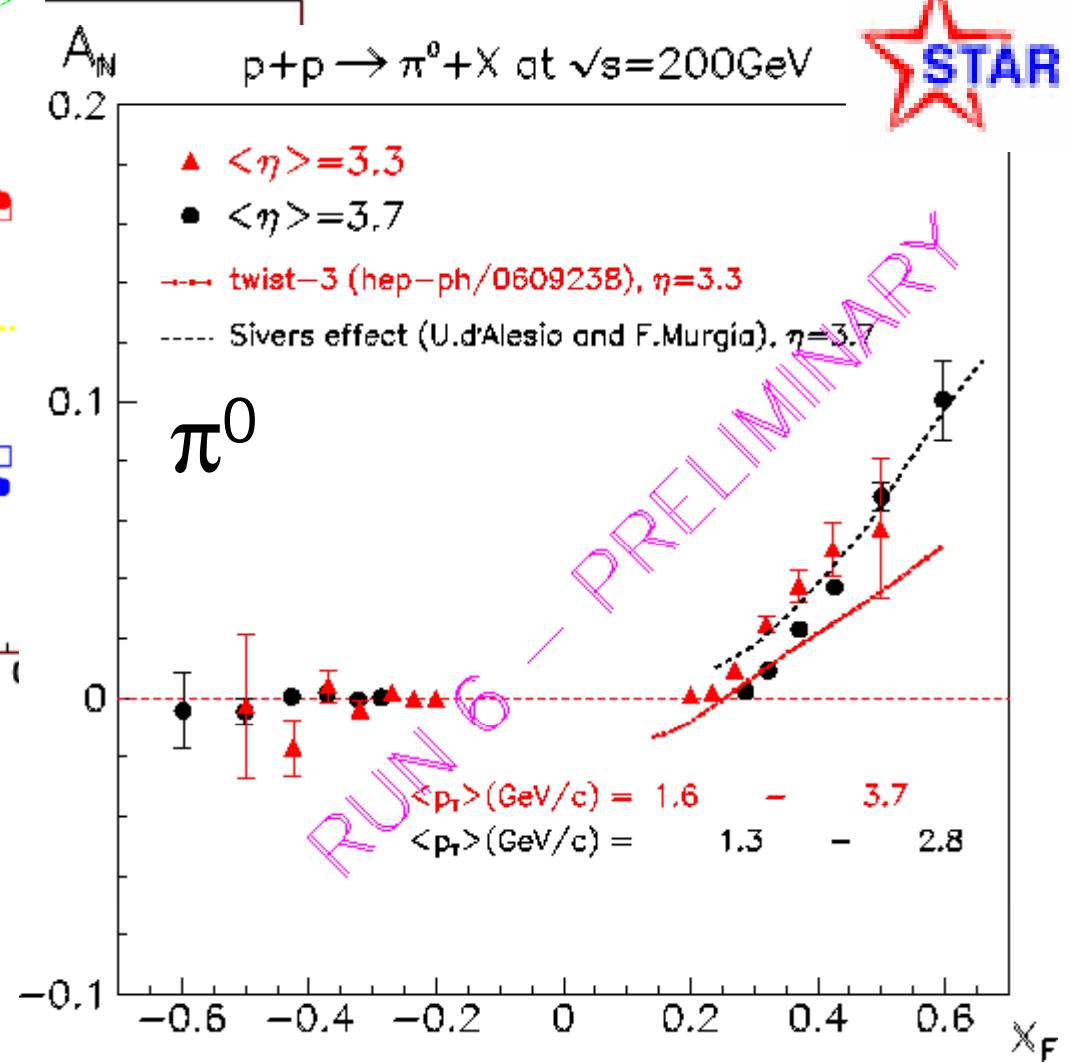
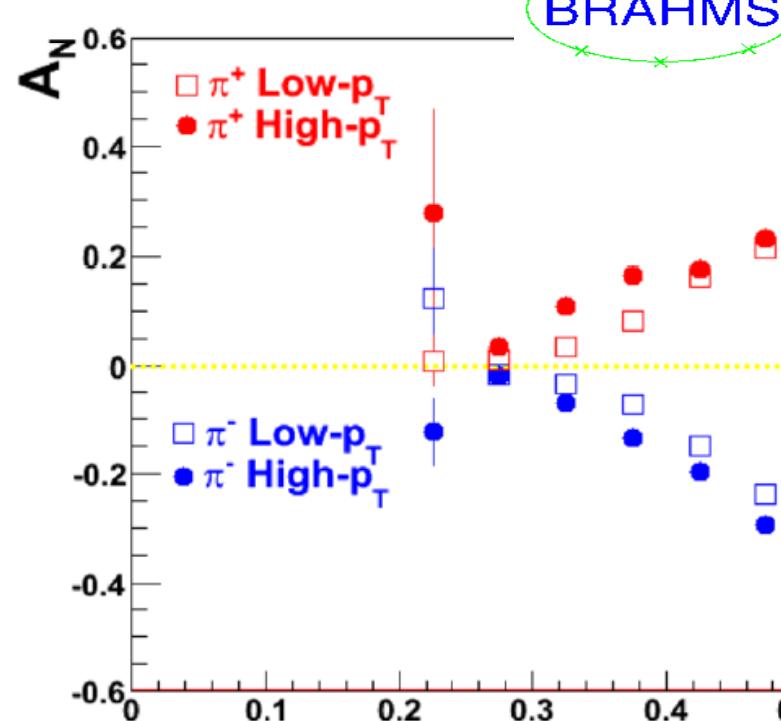
$$f_{1T}^{\perp q}(x) \otimes D_1^{\perp q}(z)$$



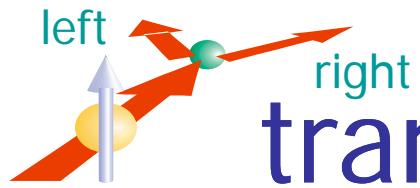


# transversity&friends @RHIC

[J. Lee, O. Eysen, S. Heppelmann, J. Balewski]

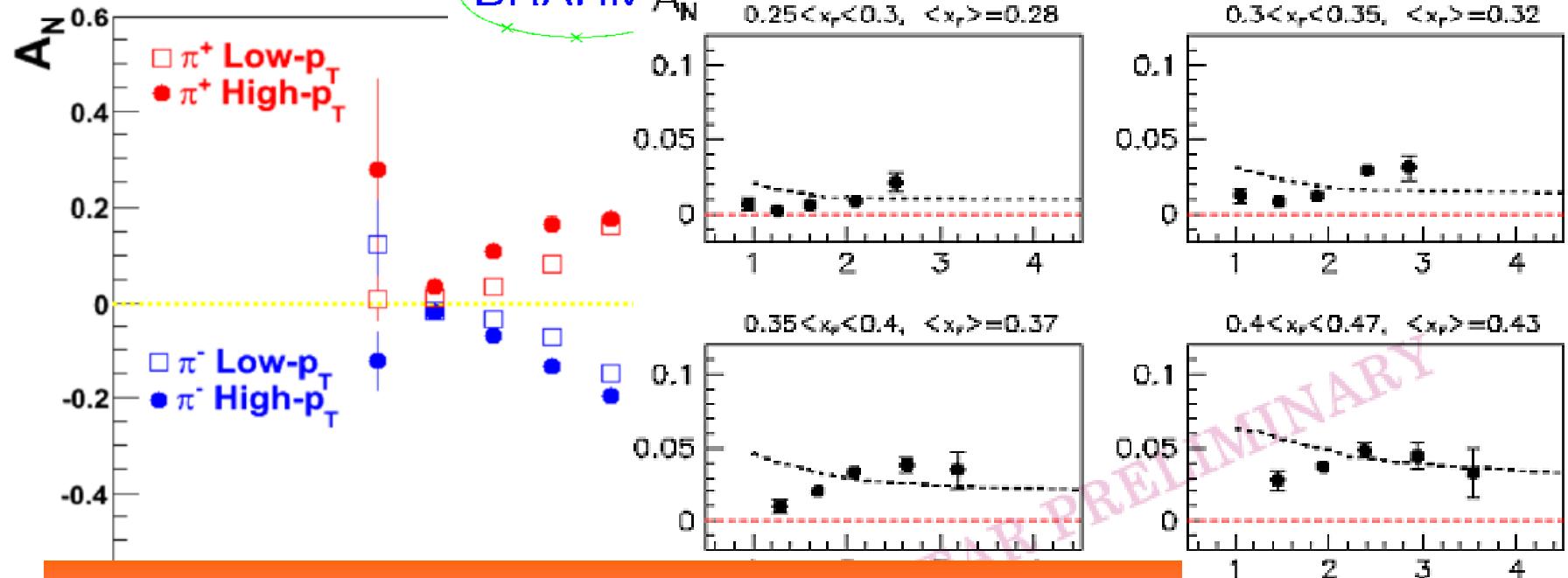


2006:  $P \sim 60\%$



# transversity&friends @RHIC

[J. Lee, O. Eysen, S. Heppelmann, J. Balewski] 



 PHENIX

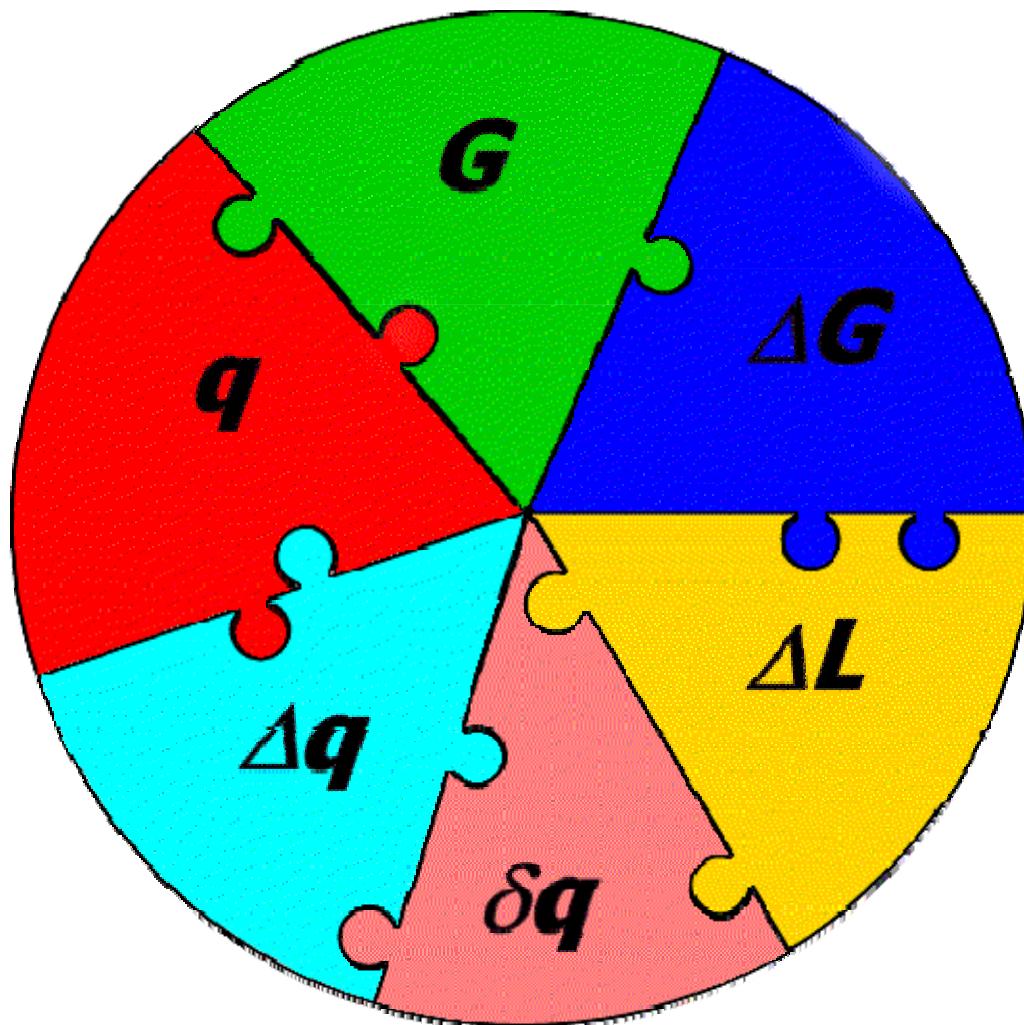
 STAR

- jet back-to-back correlations  $\rightarrow$  Sivers
- two hadron correlation  $\rightarrow$  transversity

...

- FPD data
- - Sivers effect  
(U.d'Alesio and F.Murgia)

# (spin) structure of the nucleon



**Jefferson Lab**   
HallA, CLAS

H. Guler



A. Rostomyan

A. Mussgiller

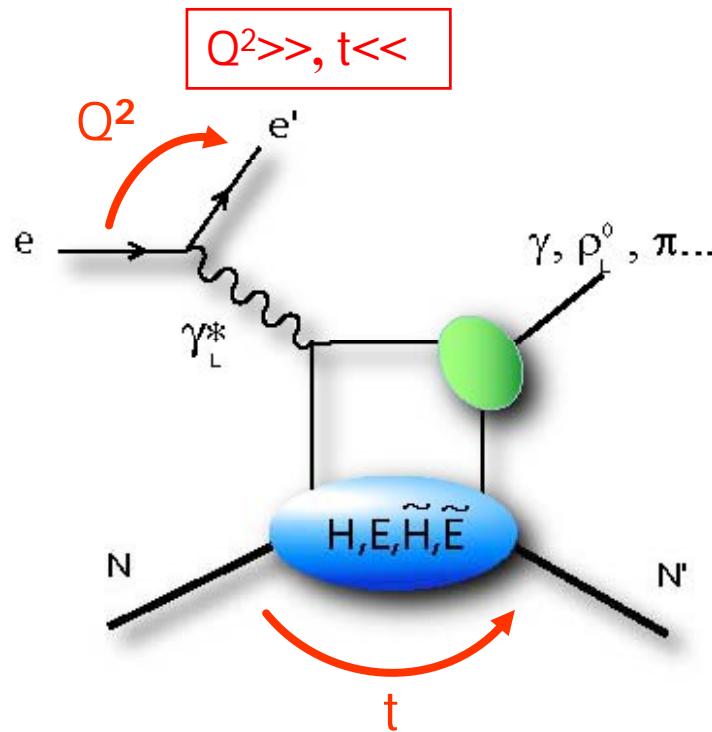
E. Voutier

J. Pierce

# hunting for $L_q$

→ hard exclusive processes:

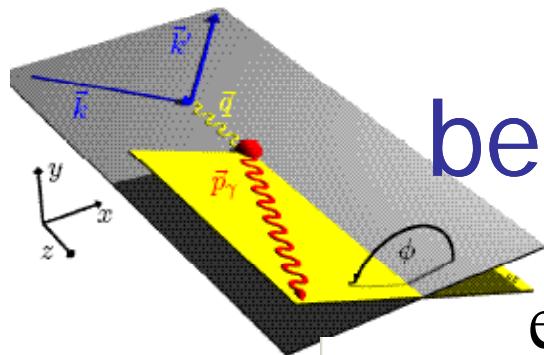
**Generalised Parton Distributions**



$$\int (\mathbf{H} + \mathbf{E}) \times d\mathbf{x} = \mathbf{J}_q$$

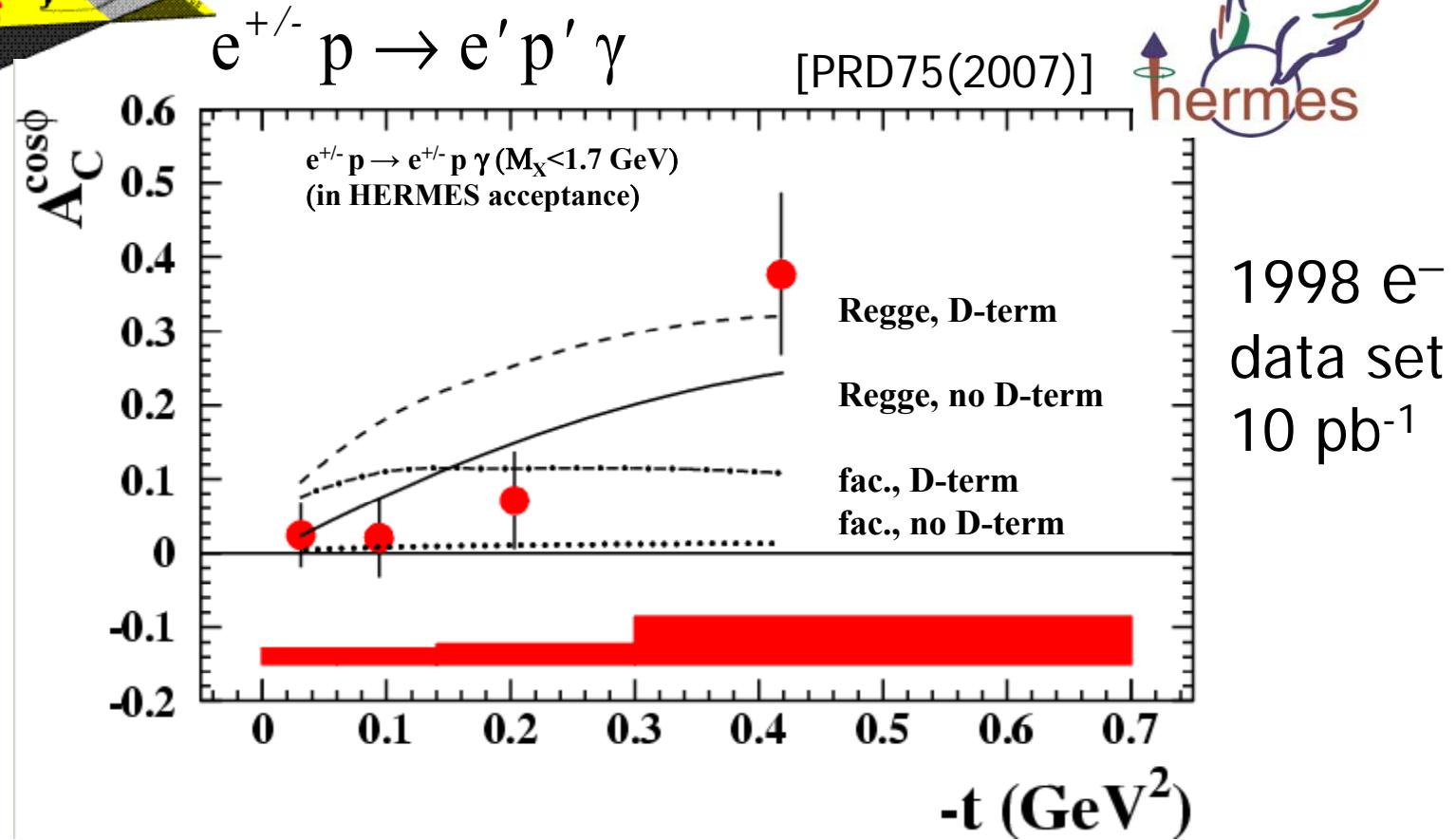
$$= 1/2 \Delta \Sigma + \mathbf{L}_z$$

10-30% (DIS)



# DVCS

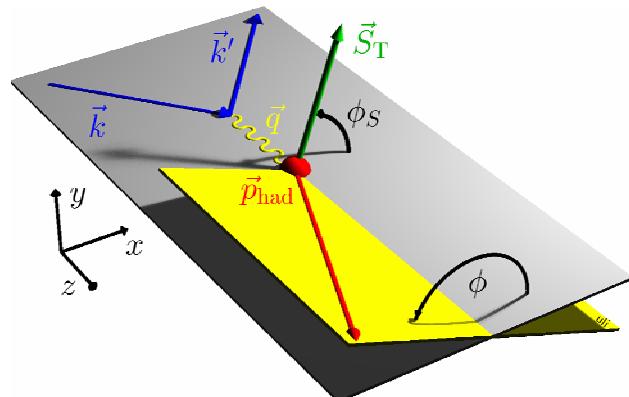
## beam *charge asymmetry*



→ 20xmore  $e^-$  statistics on tape from 2005/06

# hunting for $L_q \rightarrow$ GPD: E

observables:



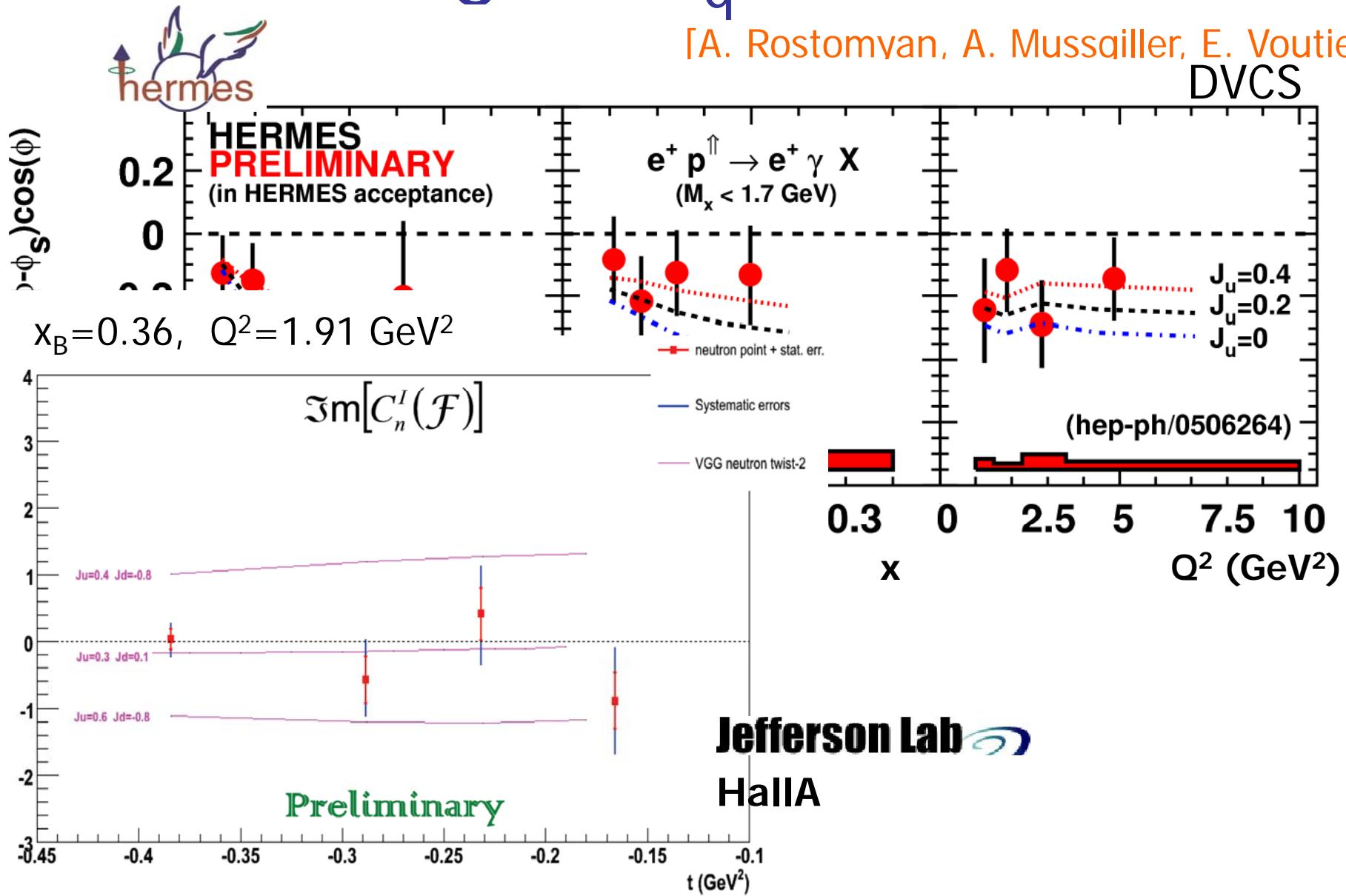
$A_{UT}$        $\rightarrow \rho^0$   
 $\rightarrow$  DVCS



DVCS cross section  
on neutron

**Jefferson Lab**   
HallA

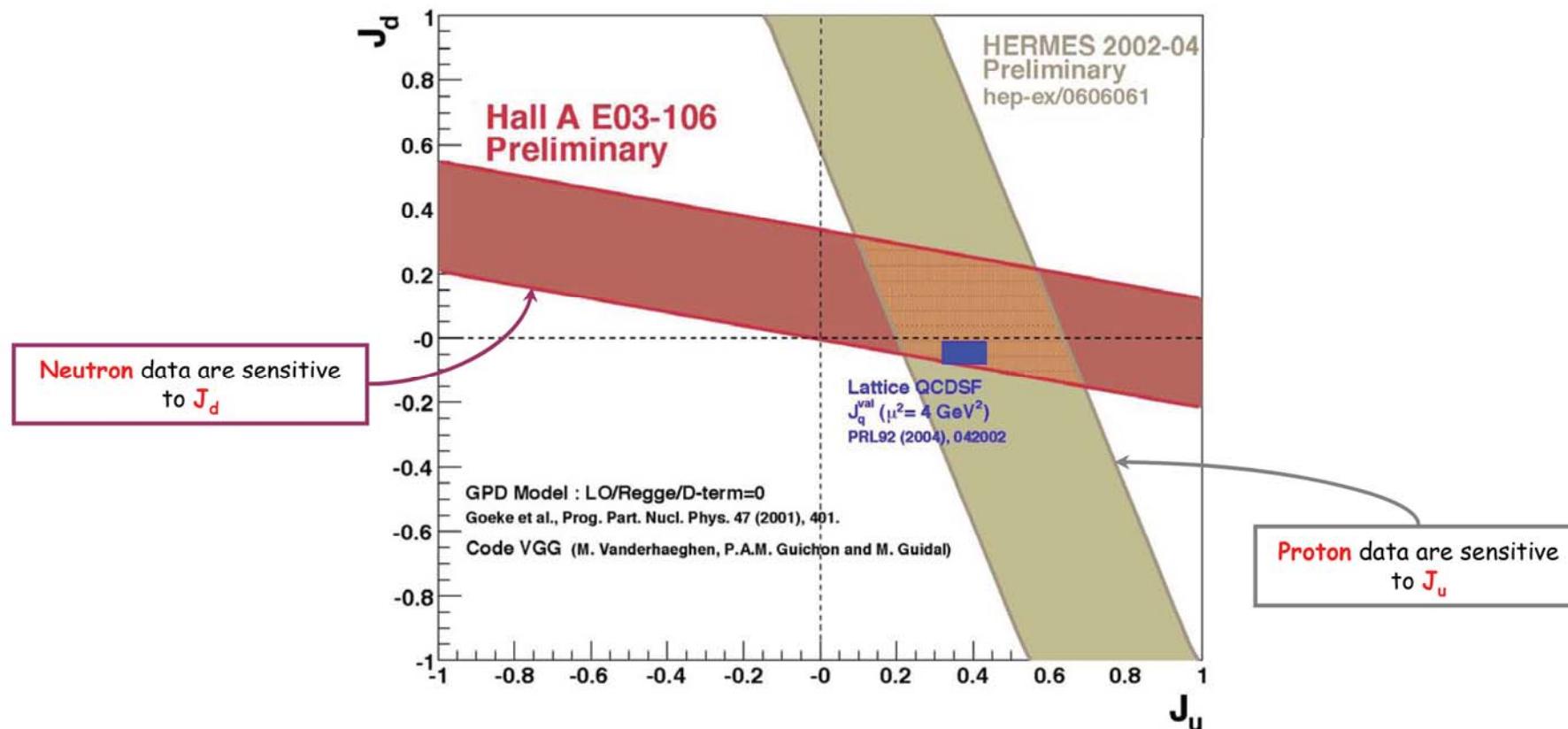
# hunting for $L_q \rightarrow$ GPD: E



# hunting for $L_q$

[A. Mussgiller, E. Voutier]

*model dependent* constraint of  $J_u$  vs  $J_d$



Complementarity between neutron and transversely polarized proton measurements

# much more polarisation observables

[Y. Naryshkin, P. Cole, J. Pierce]

- transverse  $\Lambda$  polarisation



- determining the spin structure of resonances
- transverse spin of the pion
- hydrogen hyperfine splitting



...

*spin physics is a very active field*



[apologises to all speakers not covered in this summary]