Strange Quark Polarisation Puzzle- Unfinished Quest

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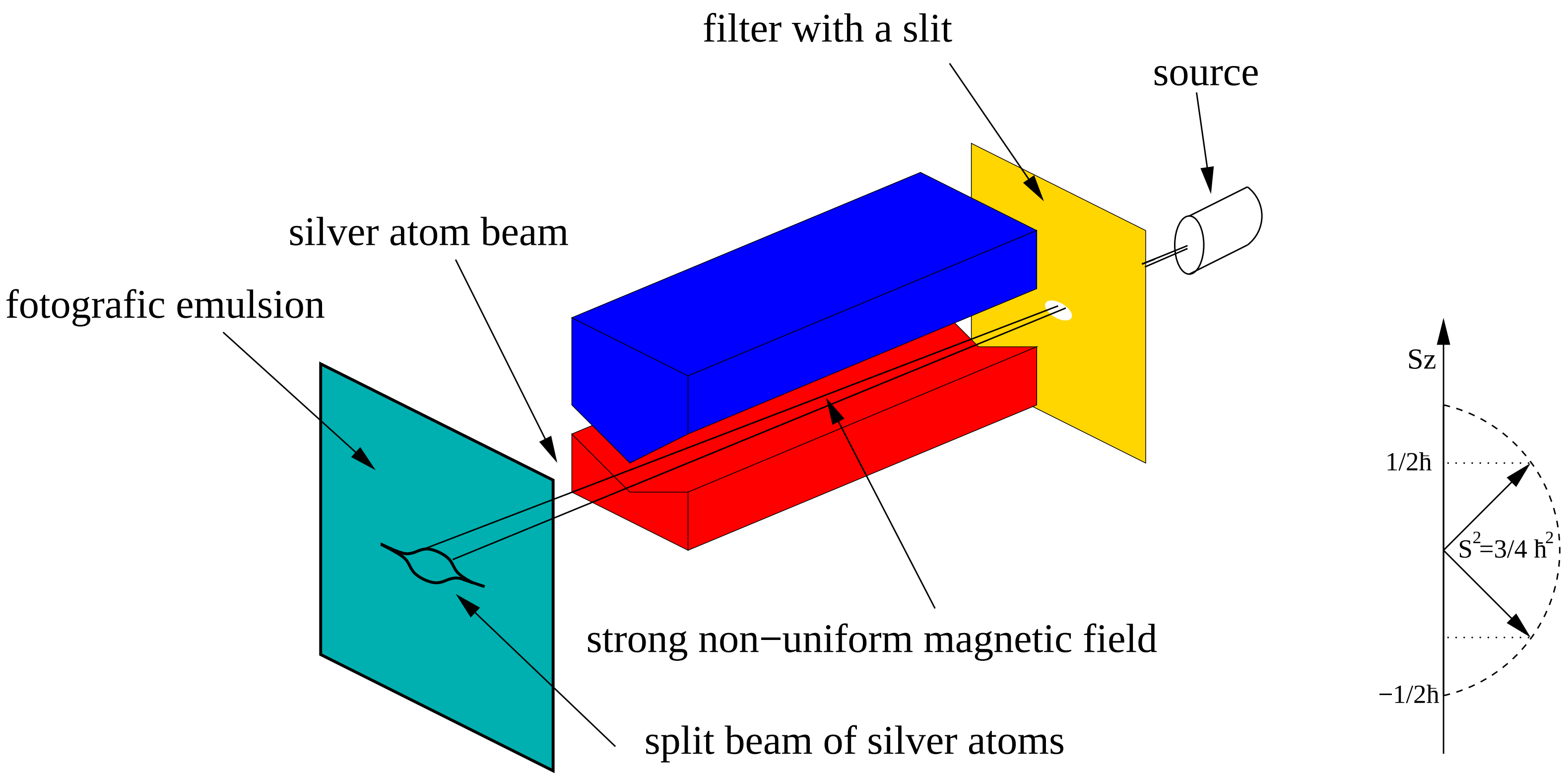
LIP

outline:

- (long) introduction
- strange quark polarisation puzzle
- analysis of HERMES data
- COMPASS data and comparison with HERMES

.

Stern-Gerlarch Experiment (1922)

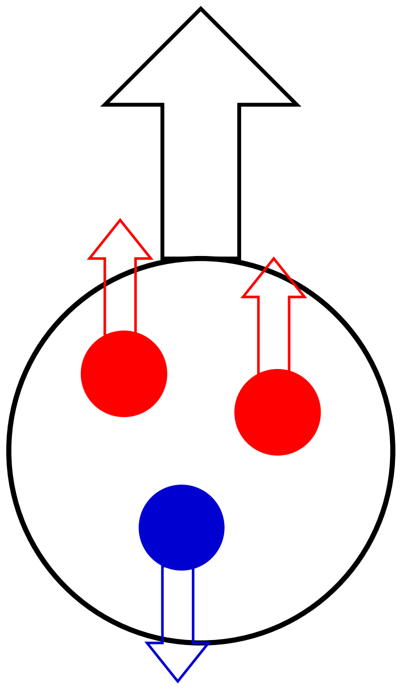


- observed: spread of the beam on 2 levels!
- classical: continuous spread of the beam
- quantum: split on 1,3,5...2L+1 levels; BTW no split expected (L=0)
- Uhlenbeck, Goudsmit (1925) introduced spin concept, as a quantum degree of freedom of particles

Quark Parton Model

- quark parton model describes:
  - masses
  - charges
  - anomalous magnetic moments ($\vec{\mu} = \frac{e_i}{2m_i}\vec{spin}$)

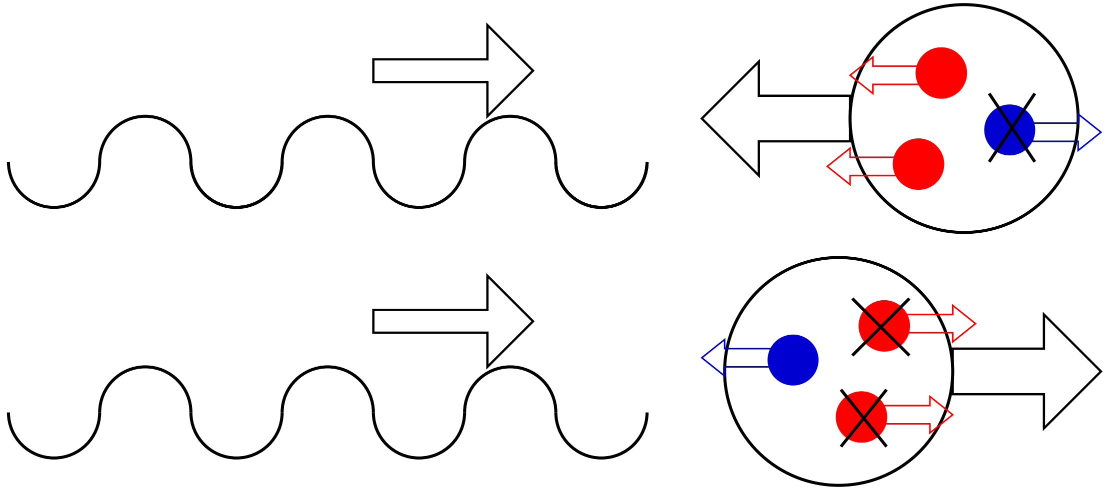
	mag.mom. QPM	mag.mom. mes.
p	+2.79	+2.793
n	-1.86	-1.913
Λ	-0.61	-0.614



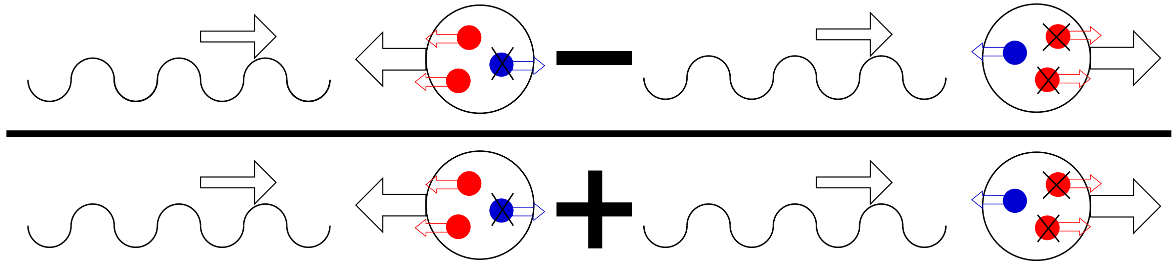
- spin ???
- in QPM: $S_p = 1/2\Delta\Sigma \rightarrow$ quarks build proton spin!

The Idea of Experiment

- interaction of polarised muons (electrons) with nucleon



- because of angular momentum conservation only quarks with a spin opposite to the spin of the photon can interact with it
- spin effects are small, precise method of extraction is needed like, asymmetry measurements

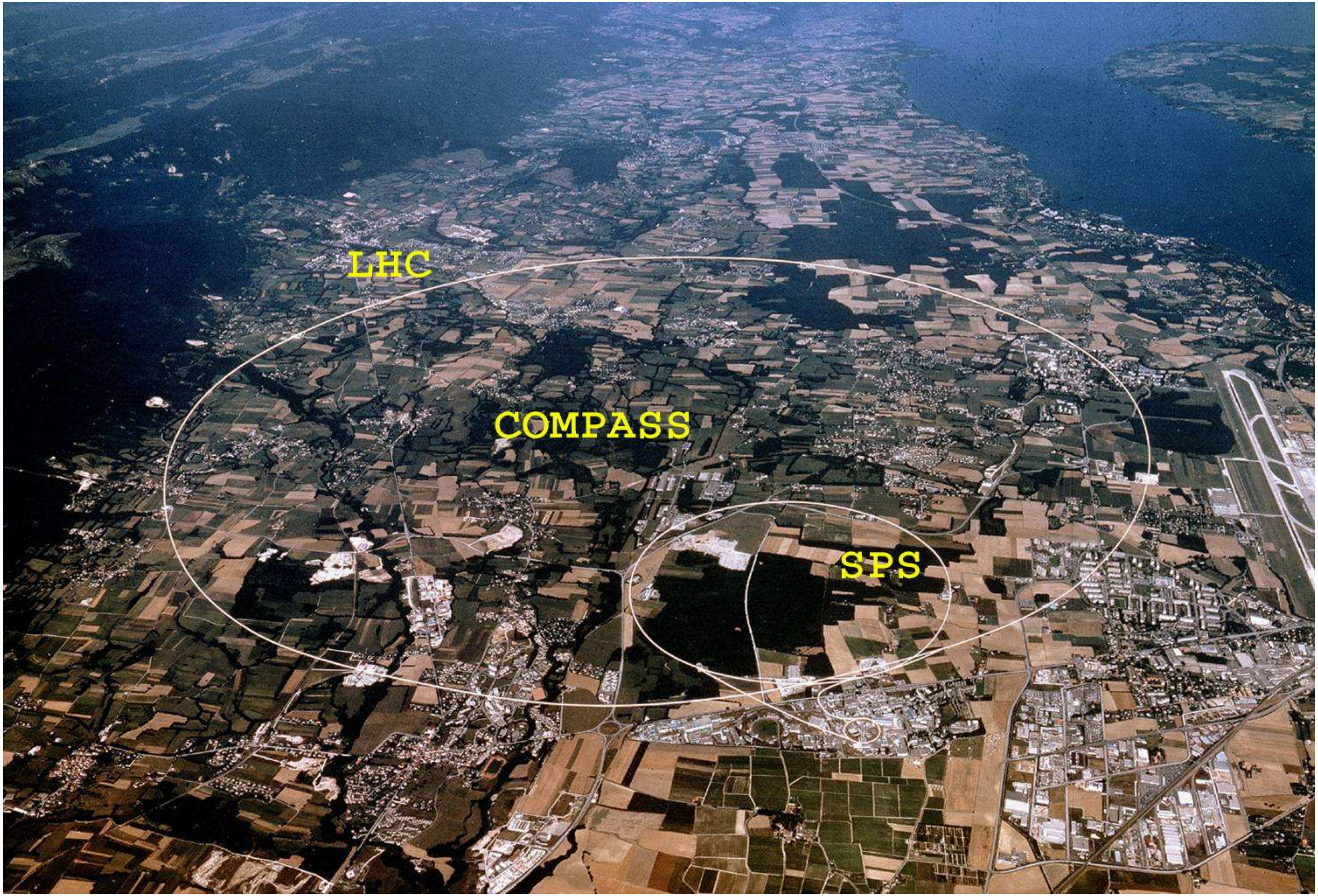


From the Idea to the Experiment

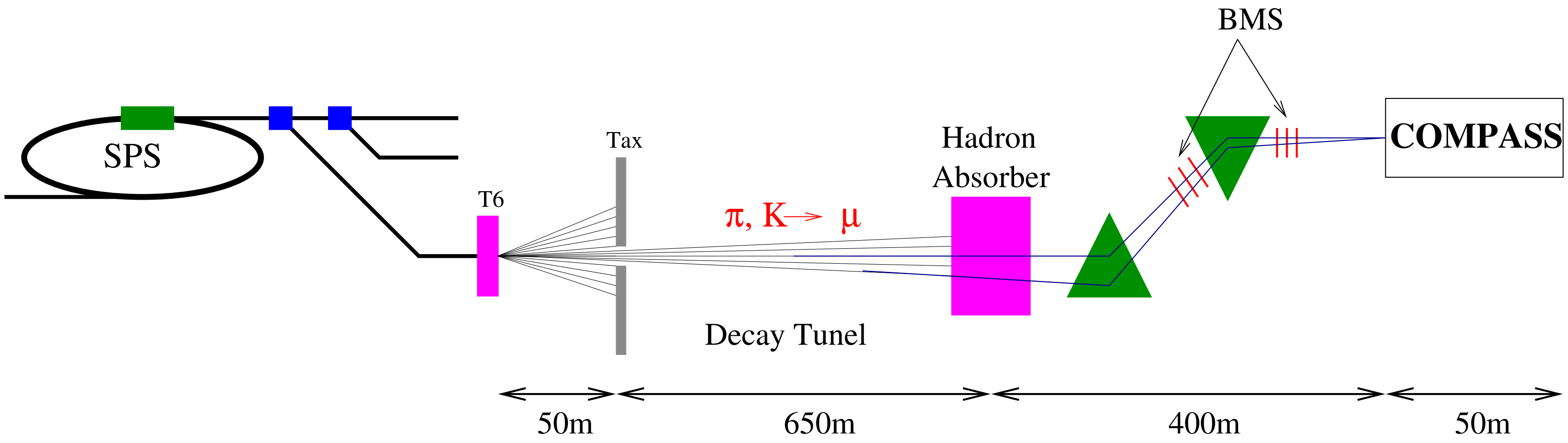
We need:

- polarised photon source $\rightarrow$ beam
- polarised nucleons $\rightarrow$ polarised target
- info about interactions $\rightarrow$ spectrometer
- details shown on an example of the COMPASS experiment

COMPASS @ CERN



The Beam

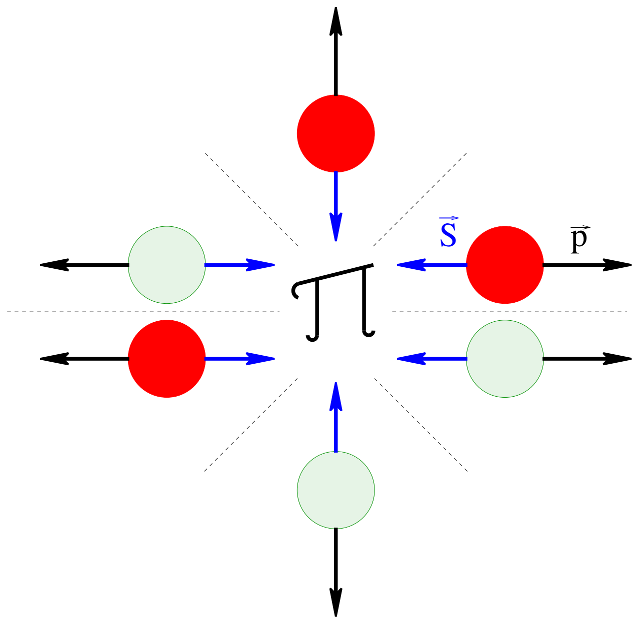


- SPS in cycles accelerates protons to energy 450 GeV
- protons are extracted on to a beryllium target $\rightarrow$ secondary particles are produced *e.g.* π, K
- π and K are not stable $\rightarrow$ decay on *e.g.* μ
- a hadron absorber stops most of the hadrons, while μ pass it
- sets of magnets focus and select μ beam of a given momentum
- the μ beam intensity: $4 \cdot 10^7/s$
- conversion efficiency: 1 μ for 10^5 protons
- muons are good sources of virtual photons...

Polarisation of the Beam

- consider decay of $\pi \to \mu\nu$
- due to CP violation $\to$ full neutrino polarisation
- conservation of angular momentum $\to$ decay muon is also polarised.

- muon momentum and its polarisation
  - parent π momentum 172 GeV
  - $\approx$ 172 GeV: $P_\mu = -1.0$
  - 160 GeV: $P_\mu = -0.8$
  - 130 GeV: $P_\mu = 0.0$
  - 98 GeV: $P_\mu = 1.0$

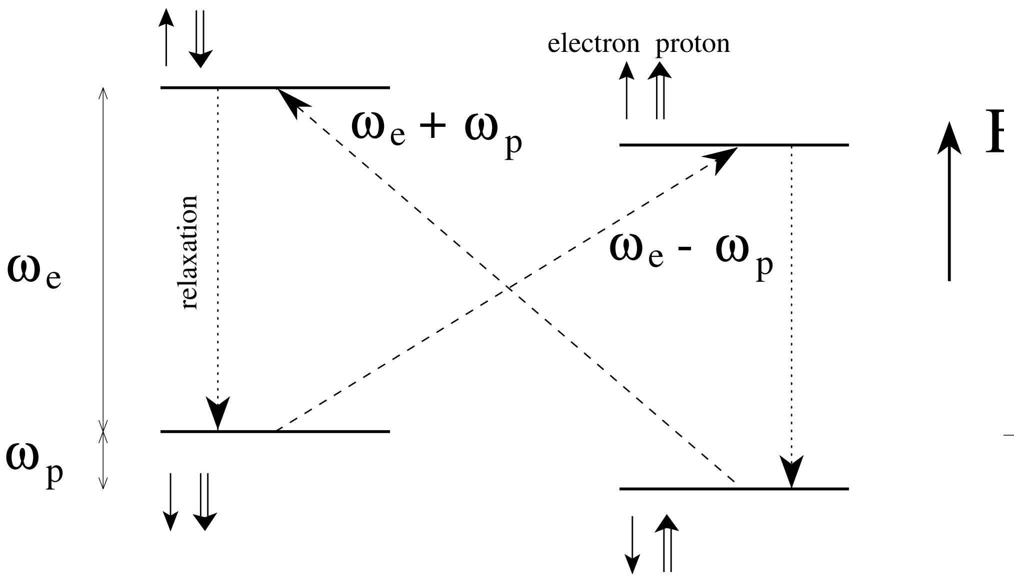


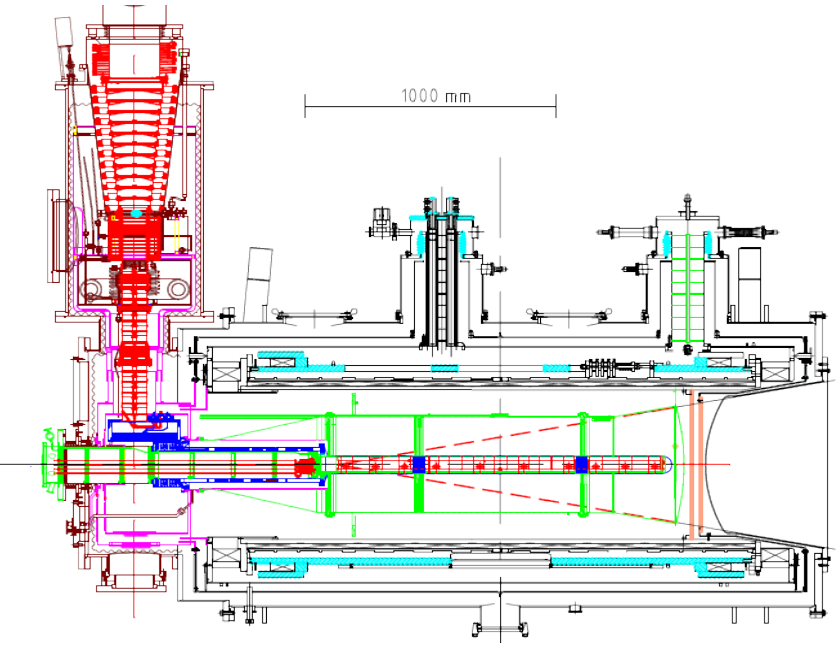
The Target Polarisation

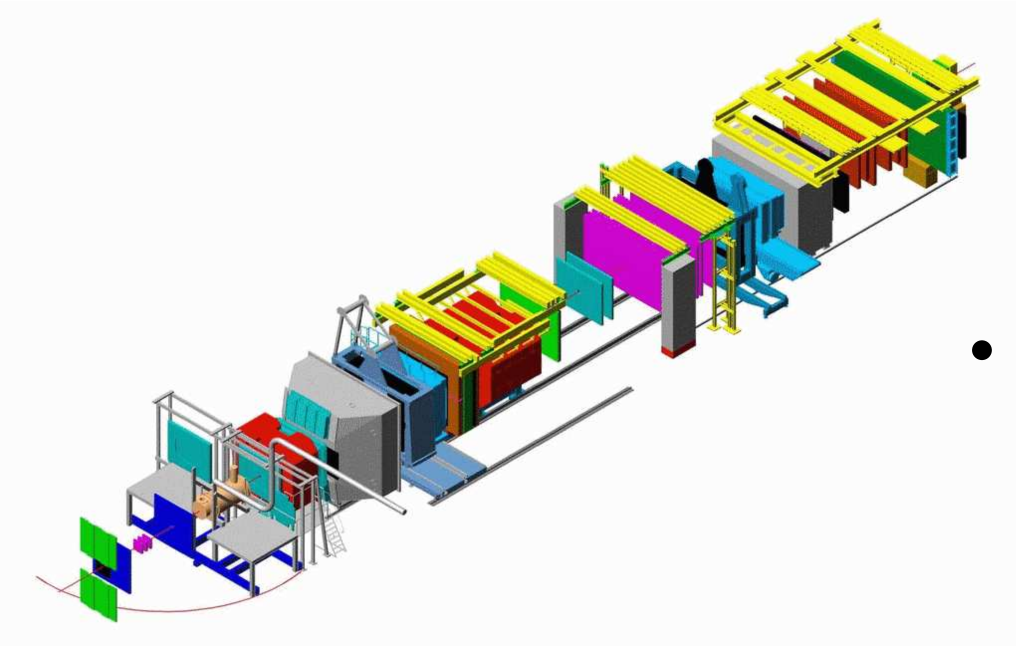
- atom in the strong magnetic field and low temperature...
- the energy levels are separated depending upon relative orientation of a particle spin and magnetic field direction $\rightarrow$ spontaneous polarisation of particles
- example of polarisation for T=50mk and B=2.5T
  - electron 99.8%
  - proton 1%
  - deuteron 0.5%
- one cannot polarise nucleons using this method...
- $\mu_p << \mu_e$, thus low magnetic moment of proton
- instead a method of dynamic nuclear polarisation is used...

The Target Polarisation cont.

- idea of DNP: simultaneous flip of electron and proton spin
- sill strong magnetic field and low temperature is needed!
- energy supplied by micro-waves ($\omega_e \approx 70 GHz, \omega_p \approx 105 MHz$)
- electron relaxes in $\approx 1 \mu s$ to the ground state
- protons due to their large mass and so low magnetic moment do not change their orientation



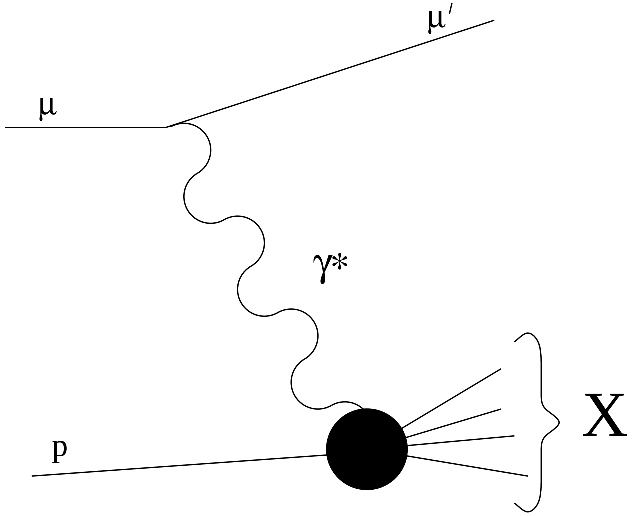




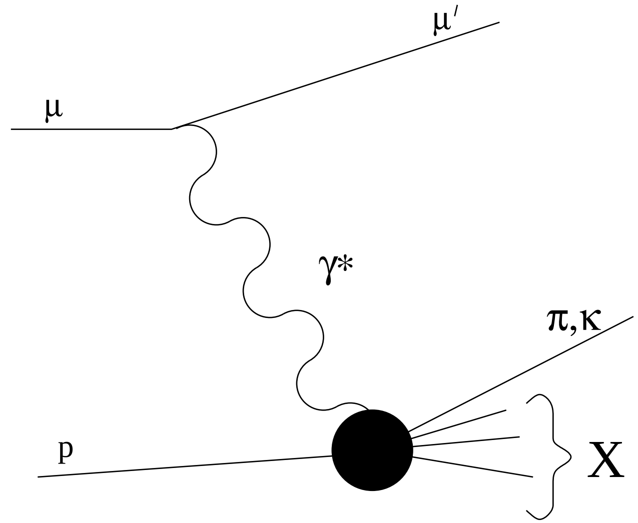
- COLLABORATION
  - about 210 physicists
  - 27 institutes
- DETECTOR
  - 60 m length
  - 2 (3) magnets
  - about 350 detector planes

- POLARISED TARGET
  - ^{6}LiD (NH_3) target
  - 2-3 cells (120 cm total length)
  - $\pm$ 50% (90%) polarization
  - polarisation reversal every 8h-24h
- POLARISED BEAM
  - positive muons at 160/(200) GeV/c (2011)
  - polarisation –80 %
- FEATURES
  - acceptance: 70 (180) mrad (2006)
  - track reconstruction: $p > 0.5$ GeV/c
  - identification h, e, μ: ECAL, HCAL and muon filters
  - identification: π, K, p (RICH) above 2, 9, 18 GeV/c respectively

Studied Processes



- **D**eep **I**nelastic **S**cattering- (**DIS**)
- incoming and outgoing muon four-momenta are measured
- the target mass is known
- the final state X is not looked at
- the cleanest measurement

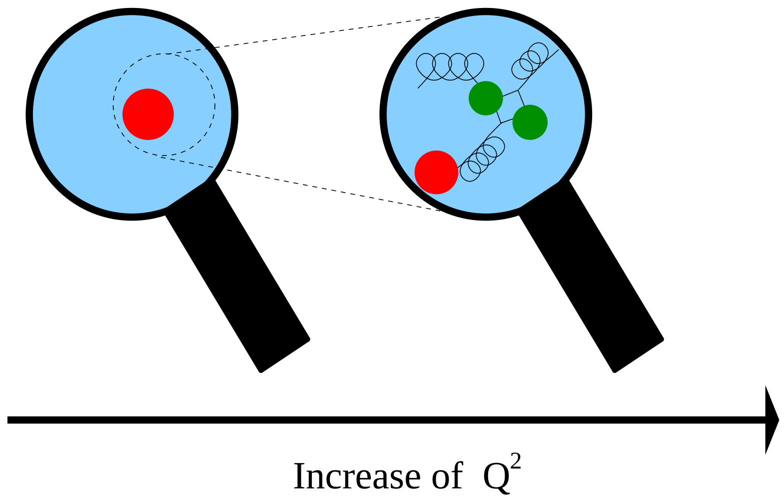


- **S**emi-**I**nclusive **D**eep **I**nelastic **S**cattering (**SIDIS**)
- the difference w.r.t. DIS: the final state is look at
- additional complication arise: what is probability that a quark of type q fragments into a hadron type h?
- a new non perturbative object needed - Fragmentation Functions (FF)

Kinematic Variables

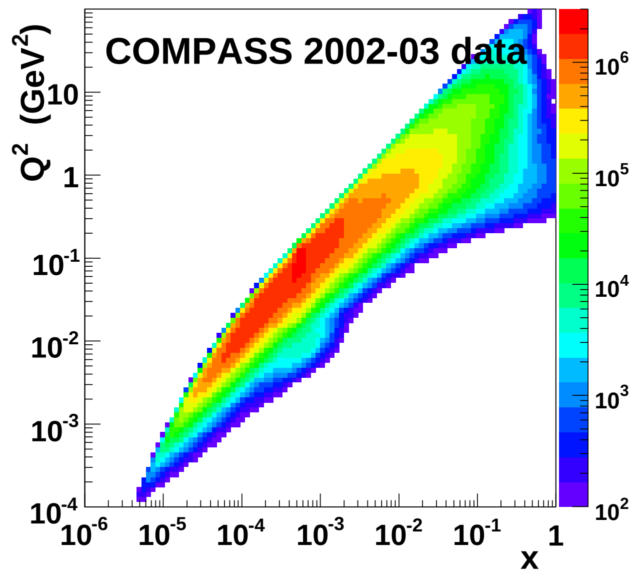
Q^2:

- four-momentum transfer from lepton to nucleon
- $Q^2 = -m^2_{\gamma^*}$; $Q^2 \in (0, \infty)$ GeV^2
- Q^2 is a photon resolution
- $Q^2 \approx 1\text{GeV}^2 \rightarrow \delta r \approx 1$ fm
- DIS: $Q^2 > 1$ GeV^2 - the perturbative region



Bjorken x:

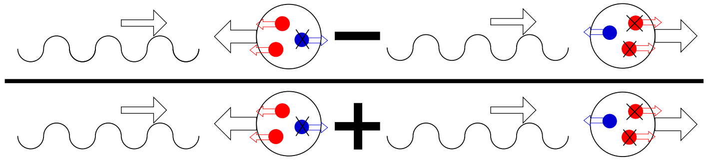
- in the frame of the infinite proton momentum x is a fraction of the proton momentum carried by the quark (parton)



hadron z

- the energy ratio of the hadron to the virtual photon
- variable used in SIDIS

The Measurement and the Physics



$$= \frac{N^{\uparrow\downarrow} - N^{\uparrow\uparrow}}{N^{\uparrow\downarrow} + N^{\uparrow\uparrow}} = A_{raw}$$

- $A_1 = \frac{A_{raw}}{f D P_b P_T}$
  - f- dilution factor - fraction of polarisable material in the target
  - P_b,P_T - beam and target polarisations
  - D - depolarisation factor (polarisation transfer $\mu \to \gamma^*$)
  - $f D P_b P_T$ of the order of 0.05 - 0.10 in COMPASS
- $g_1 = A_1 \cdot F_1$
  - $F_1(x)$ is unpolarised structure function $F_1(x) = 1/2 \sum_i e_i^2 q_i(x)$
  - $g_1(x)$ is the number density of quarks polarised parallel-anti-parallel to the proton spin, $g1(x) = 1/2 \sum_i \Delta e_i^2 q_i(x)$
- $\Gamma_1 = \int_0^1 g_1(x) dx$ - the first moment of g_1

Short Story of Spin Measurements

- first asymmetry measurement in SLAC, USA since 1975, made by Vernon Hughes.
- results with large uncertainties were agreeing with expectations
- unexpected results of EMC (1987) starts the so-called "spin crisis": quarks carry only $10\% \pm 15\%$ of the proton spin
  - **Phys. Lett. B206**(1988),364; cited 1659 times
  - **Nucl. Phys. B328**(1989),1; cited 1422 times
- second generation of experiments to confirm EMC results, at CERN and US (early-mid of 90')
- third generation of experiments trying to solve spin puzzle COMPASS @ CERN, HERMES @ DESY, experiments at US in RHIC and JLab laboratories
- fourth generation is in plans...

EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

CERN-EP/87-230
December 23rd, 1987

A MEASUREMENT OF THE SPIN ASYMMETRY AND DETERMINATION OF THE STRUCTURE FUNCTION g_1 IN DEEP INELASTIC MUON-PROTON SCATTERING

The European Muon Collaboration

Aachen[1], CERN[2], Freiburg[3], Heidelberg[4], Lancaster[5], LAPP (Annecy)[6], Liverpool[7], Marseille[8], Mons[9], Oxford[10], Rutherford[11], Sheffield[12], Turin[13], Uppsala[14], Warsaw[15], Wuppertal[16], Yale[17].

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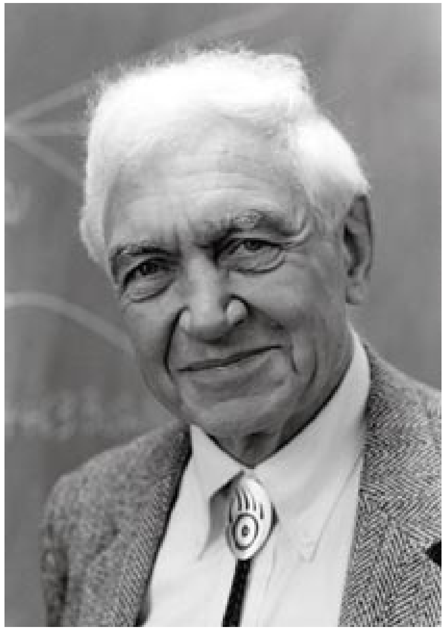
(Submitted to Physics Letters)

ABSTRACT

The spin asymmetry in deep inelastic scattering of longitudinally polarised muons by longitudinally polarised protons has been measured over a large x range (.01 < x < 0.7). The spin dependent structure function $g_1(x)$ for the proton has been determined and its integral over x found to be 0.114 ± 0.012 ± 0.026, in disagreement with the Ellis-Jaffe sum rule. Assuming the validity of the Bjorken sum rule, this result implies a significant negative value for the integral of g_1 for the neutron. These values for the integrals of g_1 lead to the conclusion that the total quark spin constitutes a rather small fraction of the spin of the nucleon.

For footnotes see next page.



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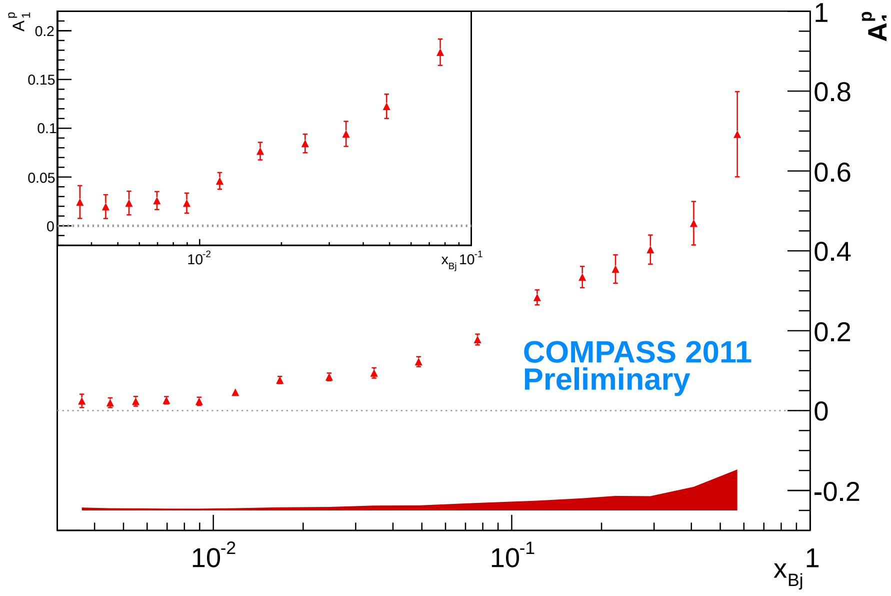
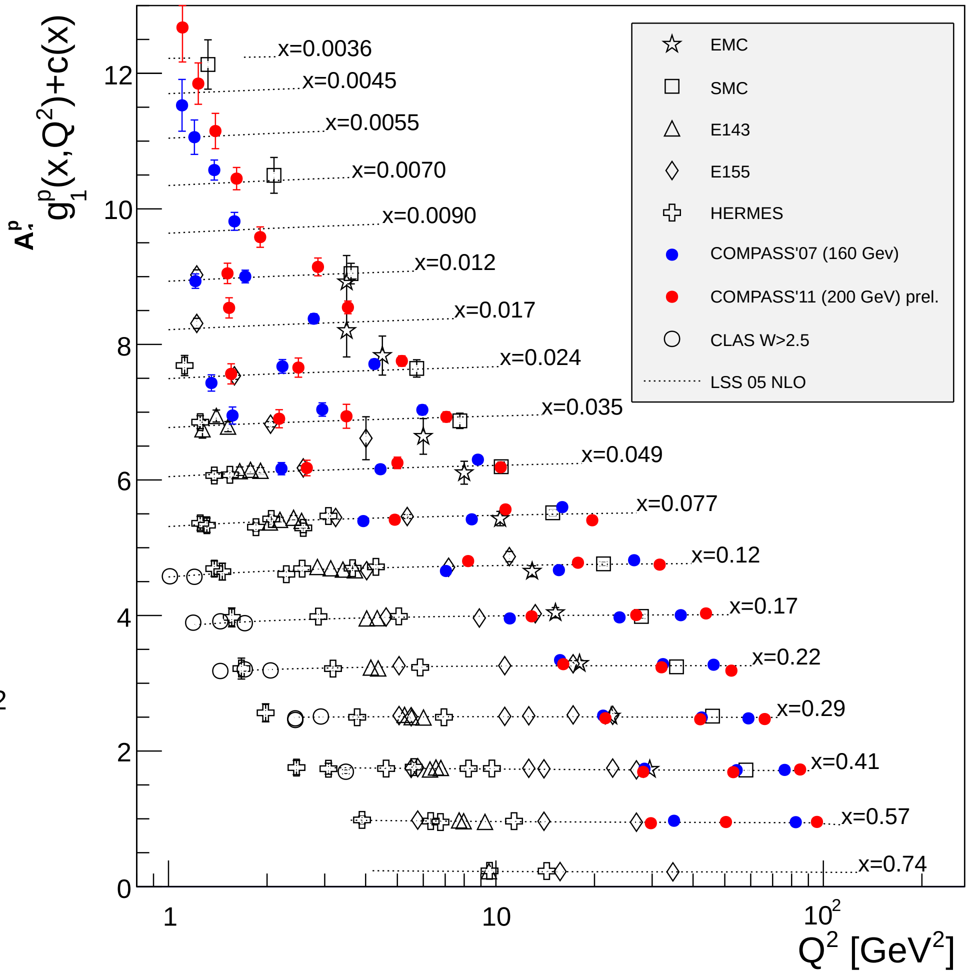
Modern Results



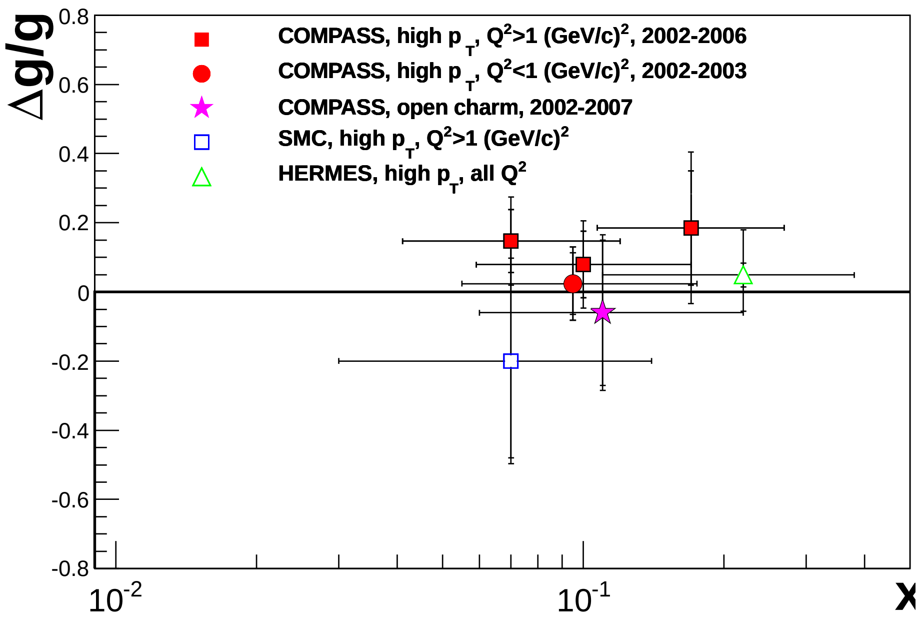


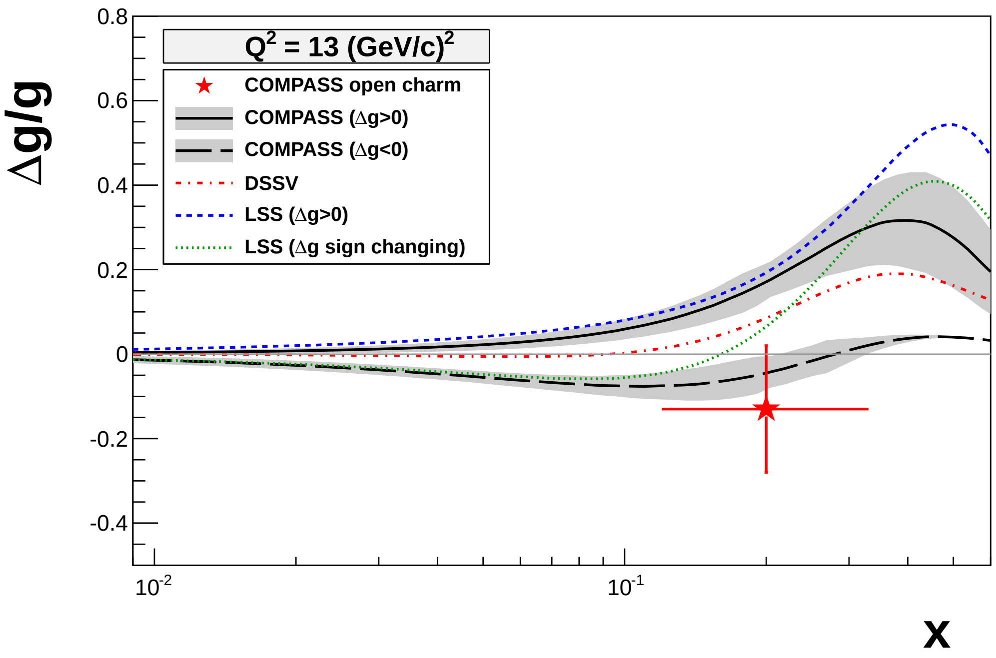
Modern Results cont.

- reminder: it was expected that quarks, $\Delta\Sigma$, carry spin of the proton,
- $S_p = 1/2 = 1/2\Delta\Sigma$
- current experiments: $\Delta\Sigma = 0.30 \pm 0.01 \pm 0.02$ ($\bar{M}S$ scheme)
- **the spin crisis:** what builds up the spin of the proton?
- $S_p = 1/2 = 1/2\Delta\Sigma + \Delta G + L_{q,g}$, where:
  - ΔG gluon contribution
  - $L_{q,g}$ angular momentum contribution of quark and gluons
- one of the COMPASS main goal was to measure $\Delta G/G$

$\Delta G/G$

- subject of Celso and Luis PHD theses
- published: **PLB 718** (2013) 922 and **PRD 87** (2013) 052018
- NLO analysis for charm events
- $\Delta G/G$ is small
- the latest results from RHIC shows that it might be indeed positive





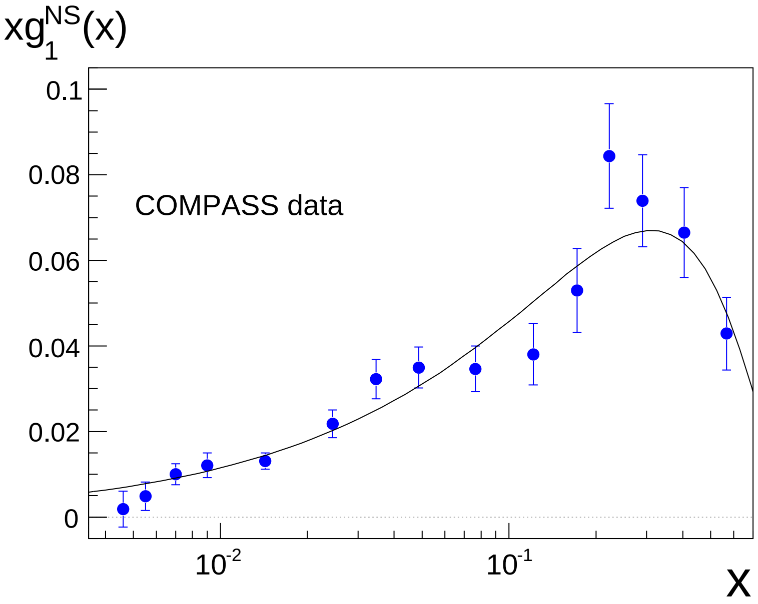
- **however, the spin crisis is not the main topic of the seminar...**

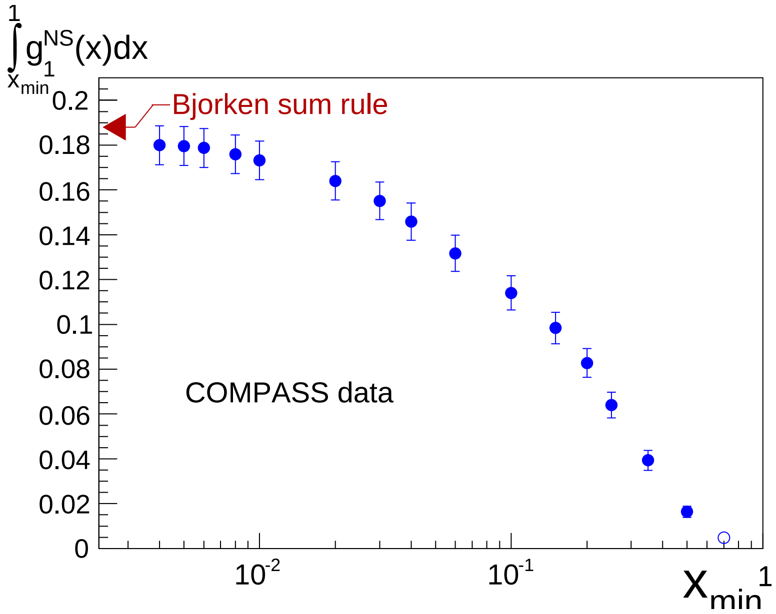
Quark Polarisation, $\Delta\Sigma$...

- $\Delta\Sigma = 0.30 \pm 0.01 \pm 0.02 = \Delta U + \Delta D + \Delta S$
- the question one may ask is what are various quark flavours contribution to the nucleon spin?
- information from:
  - inclusive asymmetries
    - $\Gamma_1^p \sim 4\Delta U + \Delta D + \Delta S$
  - semi-inclusive asymmetries
  - sum rules
- example of sum rules form SU(3) symmetry:
  - $a_3 = \Delta U - \Delta D \sim g_A/g_V$ - from neutron decay
  - $a_8 = \Delta U + \Delta D - 2\Delta S = 0.585 \pm 0.025$ - from hyperon decays
  - $a_0 = \Delta U + \Delta D + \Delta S = \Delta\Sigma = 0.30 \pm 0.02 \pm 0.01$
- observe that $(a_0 - a_8)/3 = \Delta S = -0.09$
- negative polarisation of strange quarks in the nucleon is expected!!!

Test of the Bjorken Sum Rule

- $g_1^{NS}(x,Q^2) = g_1^p(x,Q^2) - g_1^n(x,Q^2) = 2(g_1^p(x,Q^2) - g_1^d(x,Q^2))$
- $g_1^{NS}(x,Q^2)$ is interesting because its Q^2 dependence decouples from the singlet and gluon densities
- $\int_0^1 g_1^{NS}(x,Q^2) = \Gamma_1^{NS} = \frac{1}{6}\frac{g_A}{g_V} C_1^{NS}(Q^2)$,
  where $C_1^{NS}(Q^2) \approx 1$ has been calculated in pQCD up to $\alpha_s^3(Q^2)$
- $\frac{g_A}{g_V}$ can be obtained from neutron beta decay: $\frac{g_A}{g_V} = 1.2694 \pm 0.0028$

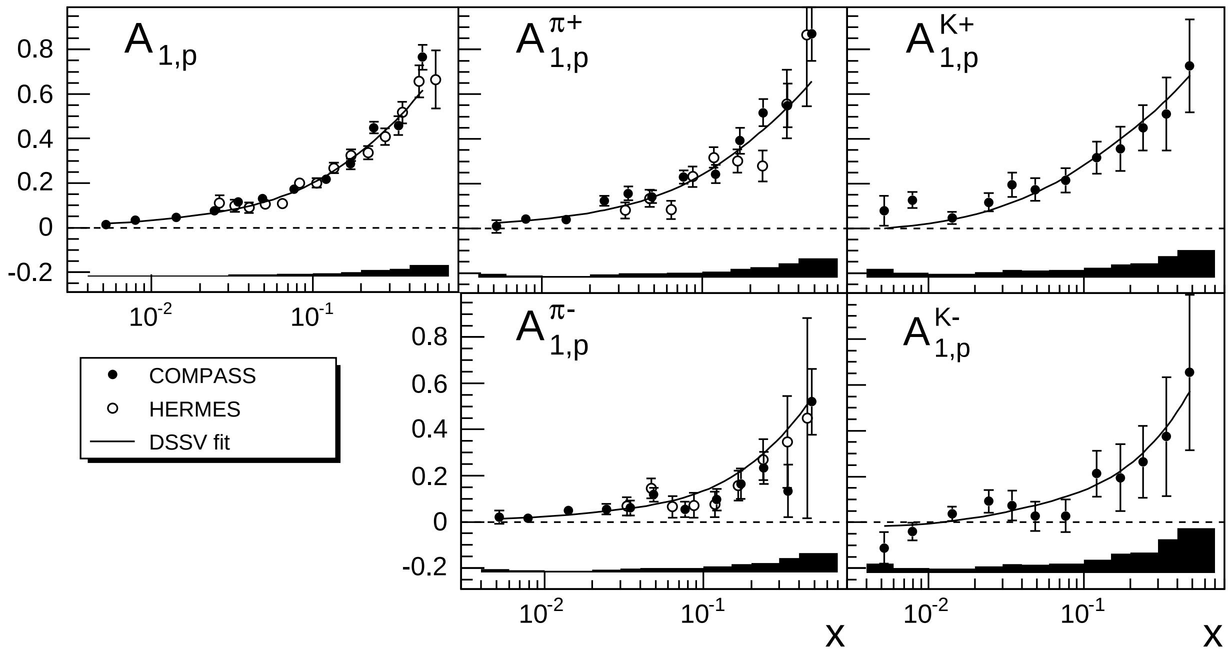




COMPASS result: $\frac{g_A}{g_V} = 1.28 \pm 0.07 \pm 0.10$

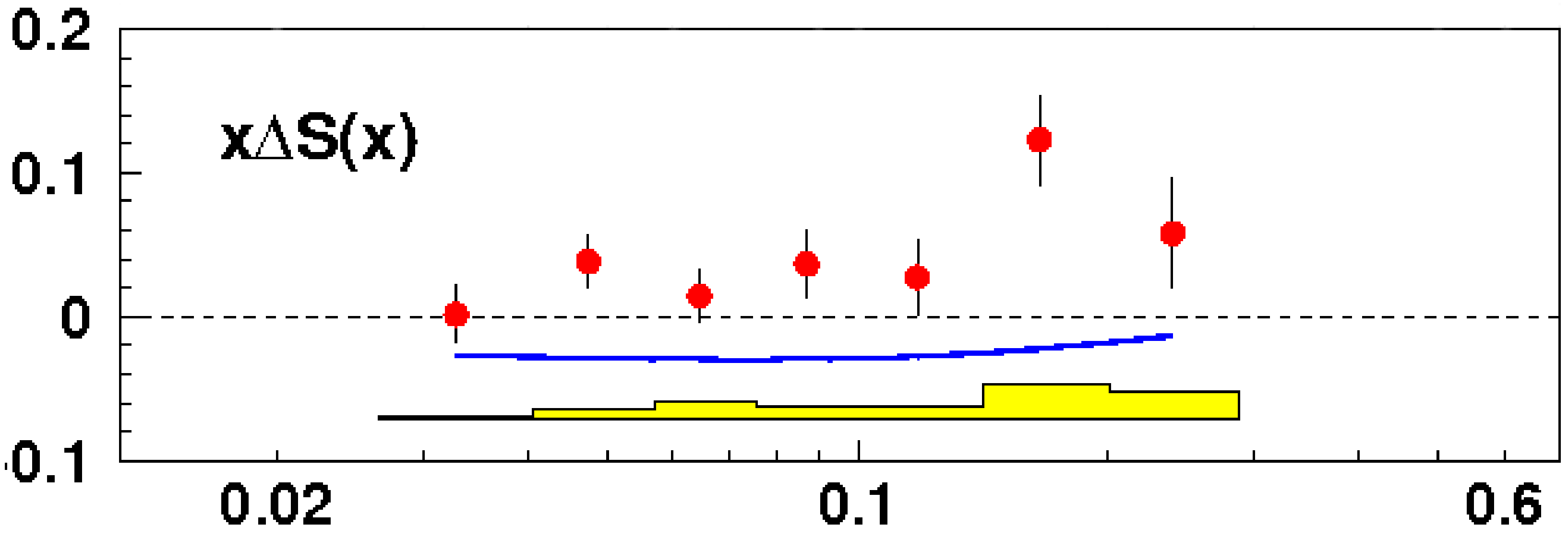
Semi-Inclusive Asymmetries and Flavour Separation

- semi-inclusive asymmetries were measured on both p and d targets
- COMPASS for the first time measured Kaons asymmetries on p target
- in the LO approximation $A_1^h(x,Q^2,z) = \frac{\sum_q e_q^2 \Delta q(x,Q^2) D_q(z,Q^2)}{\sum_q e_q^2 q(x,Q^2) D_q(z,Q^2)}$
- D is a fragmentation Function (FF)
- with 10 asymmetries ($A_{1p,d}^{incl}, A_{1p,d}^{\pi\pm}, A_{1p,d}^{K\pm}$) and 5 unknown parameters ($\Delta u, \Delta d, \Delta \bar{u}, \Delta \bar{d}, \Delta s$) a flavor separation is possible



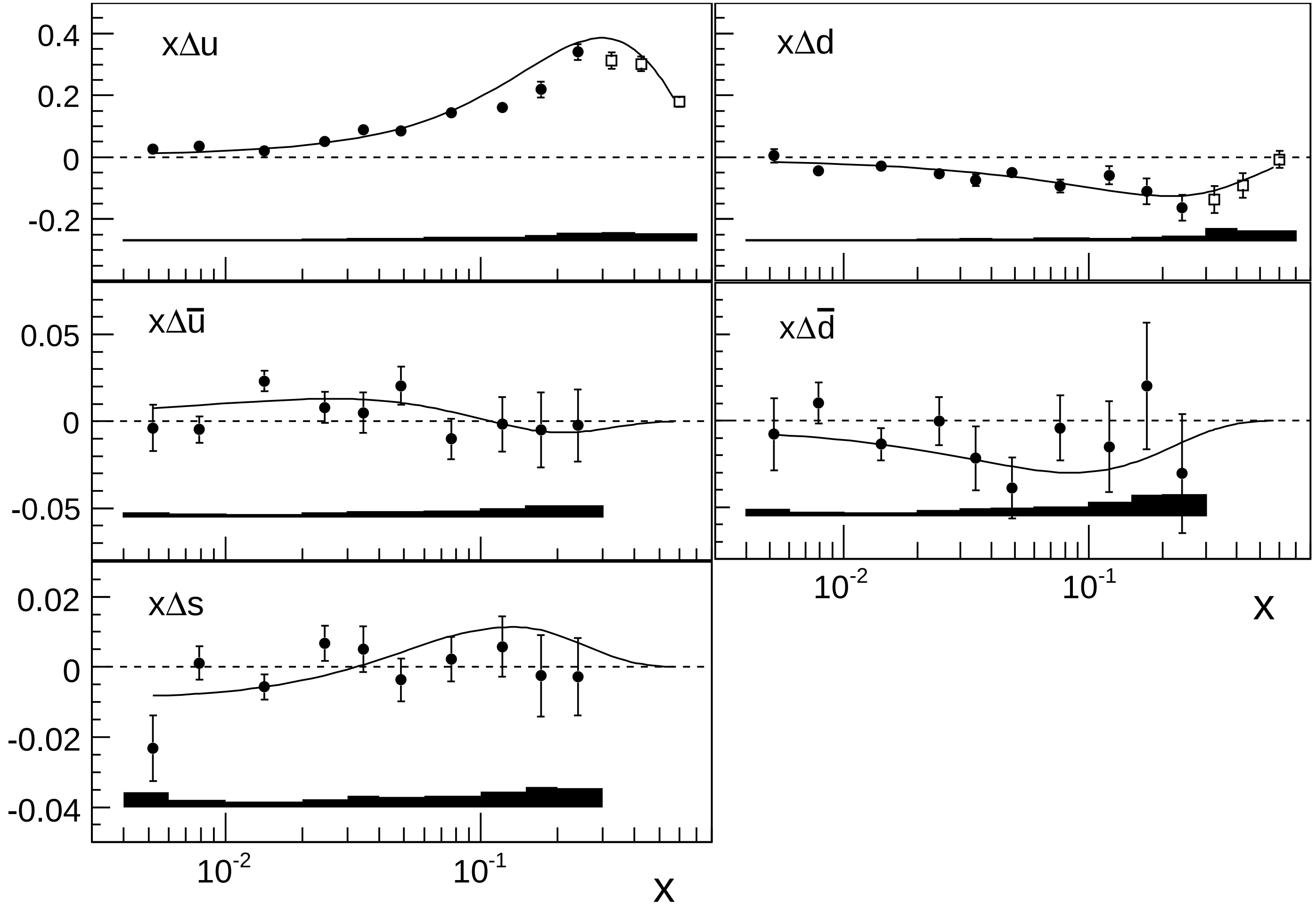
LO Flavour Separation - ΔS from HERMES

- **PLB 666** (2008) 446
- curve from LSS group **PRD** 73 034023
- clear disagreement of data with global fit is visible
- $\int_{0.02}^{0.60} \Delta S(x)dx = 0.038 \pm 0.019 \pm 0.027$



LO Flavour Separation - COMPASS

- COMPASS results: **PLB 693** (2010) 227
- curves: DSSV NLO parametrisation **PRL 101** (2008) 072001; **PRD 80** (2009) 034030, fit includes HERMES data
- good agreement between COMPASS data and DSSV parametrisation

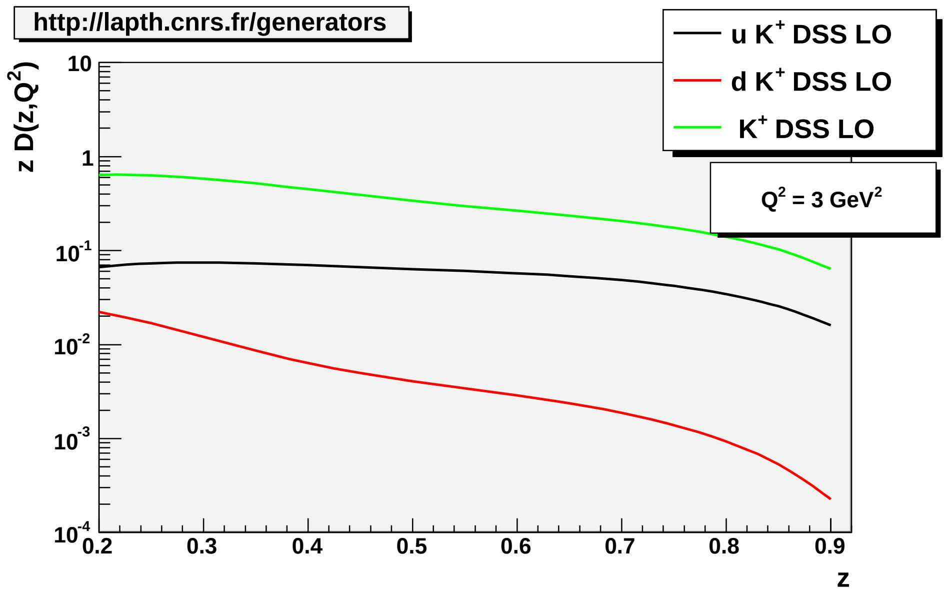


“Strange Quark Polarisation Puzzle”

- $\int_0^1 \Delta s(x) + \Delta\bar{s}(x)dx = \Delta S$ is negative from inclusive asymmetries
  $\Delta S = -0.09 \pm 0.01 \pm 0.02$
- surprisingly, SIDIS analysis do not confirm this observation.
- HERMES: $\int_{0.02}^{0.6} \Delta S(x) = +0.038 \pm 0.019 \pm 0.027$
- to accommodate the above discrepancy, in the DSS fit the $s(x)$ changes sign. So that it is positive for high x and negative for low x
- however, LSS groups claim that the value of $\Delta s(x) + \Delta\bar{s}(x)$ from the inclusive analysis is negative in the **whole** x range!
  - this is even true when π asymmetries are included in the fit
  - only Kaon asymmetries poses a problem!
  - LSS group has changed **FF set** from DSS to HKNS
  - with HKNS FF set ΔS from kaons asymmetries is also negative

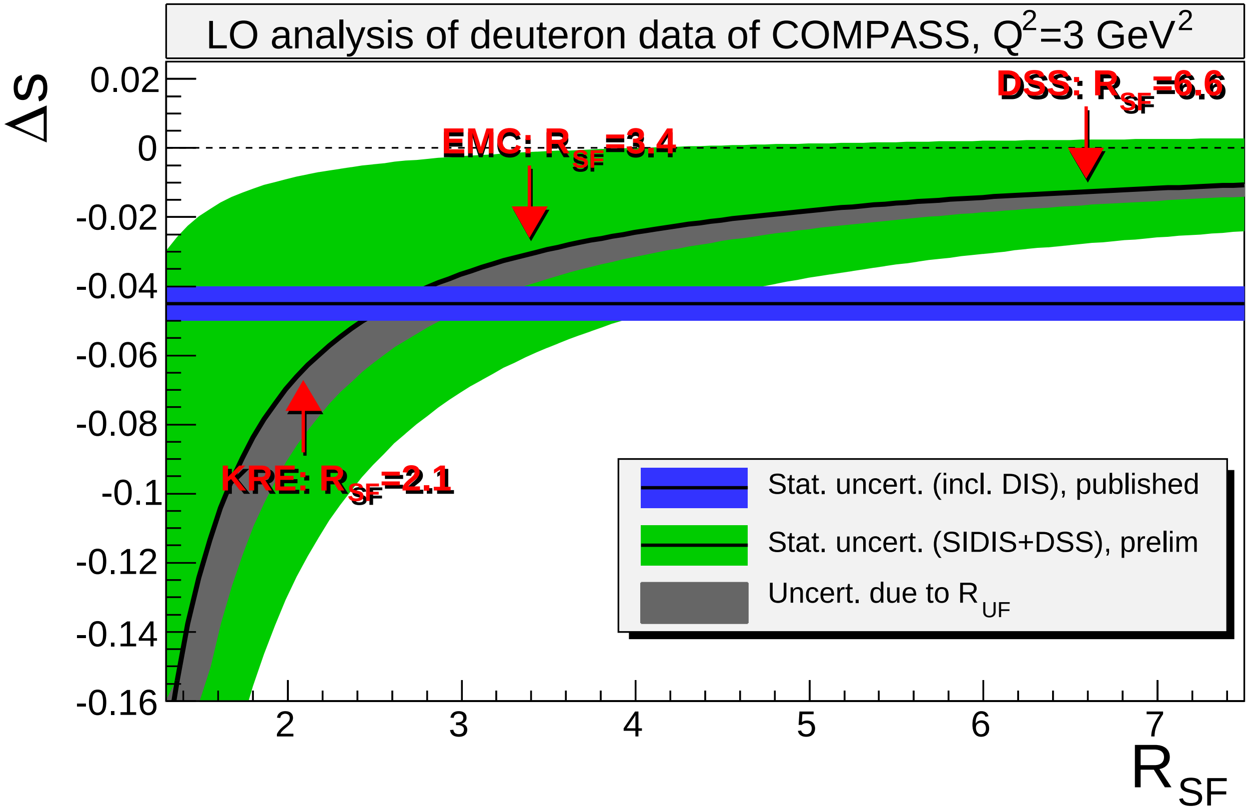
Fragmentation Functions

- non-perturbative object - must be measured in the experiment
- in LO describe probability density that a quark of type q fragments into a hadron type h - D_q^h
- D_q^h depends only upon z and weakly (DGLAP type) upon Q^2
- universal object - can be used/measured in e^+e^-, ep or pp reactions
- they are not well know in the kaon sector
- there is only one truly wold data parametrisation of FF - DSS
- however, it doesn't agree with recent SIDIS measurements....



Fragmentation Functions and ΔS

- the importance of FF for ΔS is not a new idea (COMPASS!)
- in the strange sector we have access to 3 FF
  - D_{str}: $\bar{s} \to K^+$ and c.c.
  - D_{fav}: $u \to K^+$ and c.c.
  - D_{unf}: $\bar{u}, d, \bar{d} \to K^+$ and c.c.
- the key variable from point of view of ΔS is the ratio $\int D_{str}(z)dz / \int D_{fav}(dz)$



Measurement of Fragmentation Functions

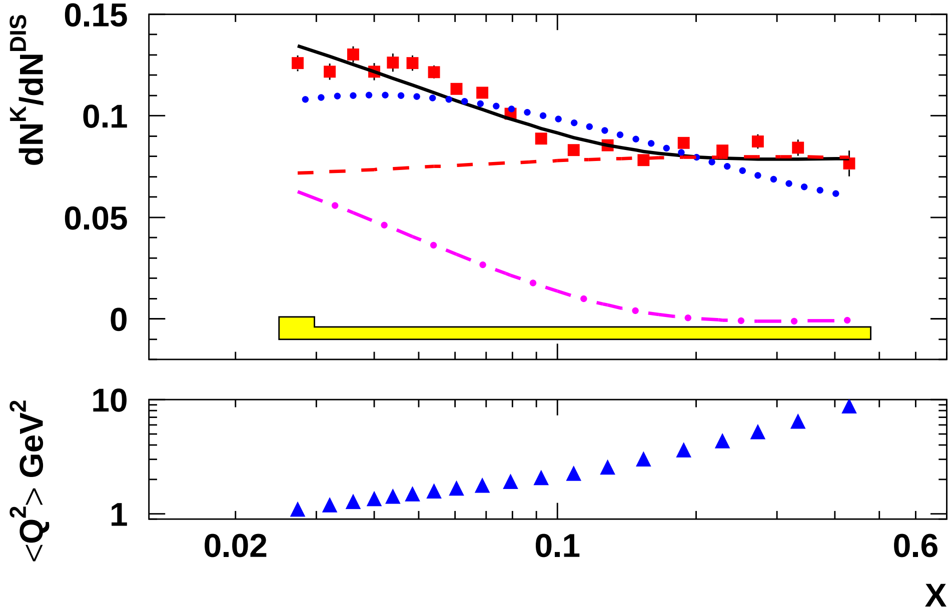
- FF can be studied in many processes in e^+e^- , ep or pp
- different processes are sensitive to different FFs
  - e^+e^- - singlet distribution (cannot tell if K^+ comes from q or $\bar{q}$)
  - pp high p_T events - sensitive to gluons
  - ep - sensitive to flavour separated FF
- the easiest way access FFs is via measurements hadron multiplicities
  - in SIDIS hadron multiplicity: $\frac{\text{number of produced hadrons}}{\text{number of DIS events}}$
  - various kinematic factors cancels in the above ratio
  - $M^{p,K^+}(x,Q^2,z) = \frac{4uD_{fav}+(4\bar{u}+d+\bar{d})D_{unf}+(s+\bar{s})D_{str}}{4u+4\bar{u}+d+\bar{d}+s+\bar{s}}$
  - $D_i(Q^2,z)$ and $q(x,Q^2) = u, \bar{u}...$
- In SIDIS multiplicities studies for different x, *i.e.* various relative contribution of q_i

Kaon Multiplicity Sum and $S(x)$

- notation and assumptions:
  - deuteron target!!!
  - $Q(x) = u(x) + \bar{u}(x) + d(x) + \bar{d}(x)$,
  - $S(x) = s(x) + \bar{s}(x)$
  - $D_Q^K = 4D_{fav} + 6D_{unf}$
  - $D_S^K = 2D_{str}$
  - kk - some kinematic factor
- $\frac{d^2N^K(x)}{dxdQ^2} = kk(x,Q^2)\left[Q(x)\int D_Q^K(z)dz + S(x)\int D_S^K(z)dz\right]$
- $\frac{d^2N^{DIS}(x)}{dxdQ^2} = kk(x,Q^2)[5Q(x) + 2S(x)]$
- dividing the two equations by each other, and neglecting $2S(x)$ one gets:
- $5\frac{dN^K(x)}{dN^{DIS}(x)} = \int D_Q^K(z)dz + S(x)/Q(x)\int D_S^K(z)$
  - $\frac{dN^K(x)}{dN^{DIS}(x)}$ - sum of kaon multiplicities

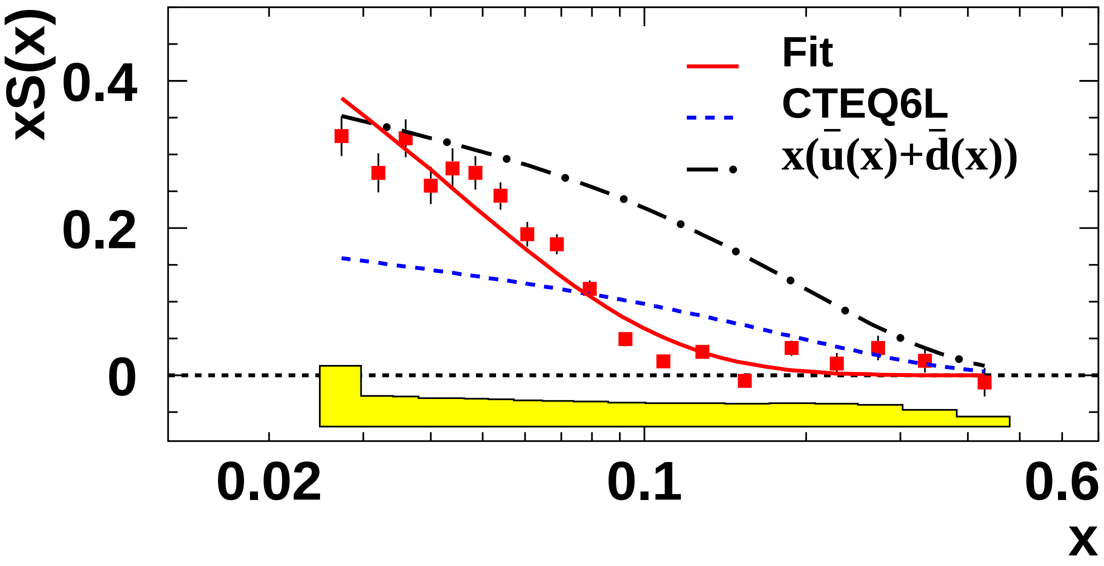
Kaon Multiplicity Sum and $S(x)$ cont.

- $5\frac{dN^K(x)}{dN^{DIS}(x)} = \int D_Q^K(z)dz + S(x)/Q(x)\int D_S^K(z)$
- at high x one can neglect $S(x)/Q(x)\int D_S^K(z)dz$!
- at high x : $5\frac{dN^K(x)}{dN^{DIS}(x)} = \int D_Q^K(z)dz$
- FFs are x independent! - one can extract $\int D_S(z)dz$ using data at low x and knowledge of $\int D_Q^K(z)dz$ at high x
- one expects flat $\frac{dN^K(x)}{dN^{DIS}(x)}$ at low x and an increase of it for lower x due to strange quarks contribution
- HERMES results from **PLB 666** (2008) 446



HERMES Results

- after the extraction of $S(x)\int D_S^K(z)dz$ HERMES tried to evaluate D_S^K
  - extraction failed - large χ^2/ndf
  - decided that the culprit is $S(x)$
- finally HERMES extracted $S(x)$ assuming $\int D_S^K(z)dz$ from DSS
- the obtained results were rather surprising:
  - the value of $S(x)$ at low x was found to be similar to $\bar{u}+\bar{d}$, contrary to most of PDF sets
  - the shape of extracted $S(x)$ was very different from $\bar{u}+\bar{d}$
- BTW. ATLAS and CMS data also prefers non-suppressed strange sea (large errors)



My Point of View...

- IMHO the HERMES analysis was oversimplified
- when unexpected behaviour is observed on the sum of K multiplicities one should verify that *e.g.* the multiplicity difference is well under control
- unfortunately charged separated multiplicities were not published at the time...
- In the seminar I will show my analysis of preliminary HERMES data shown (DIS2011)
- work summarised in hep-ex 1208.5427
- HERMES data finally published two weeks ago, **PRD 87** (2013) 074029, no big difference w.r.t. preliminary data presented here...

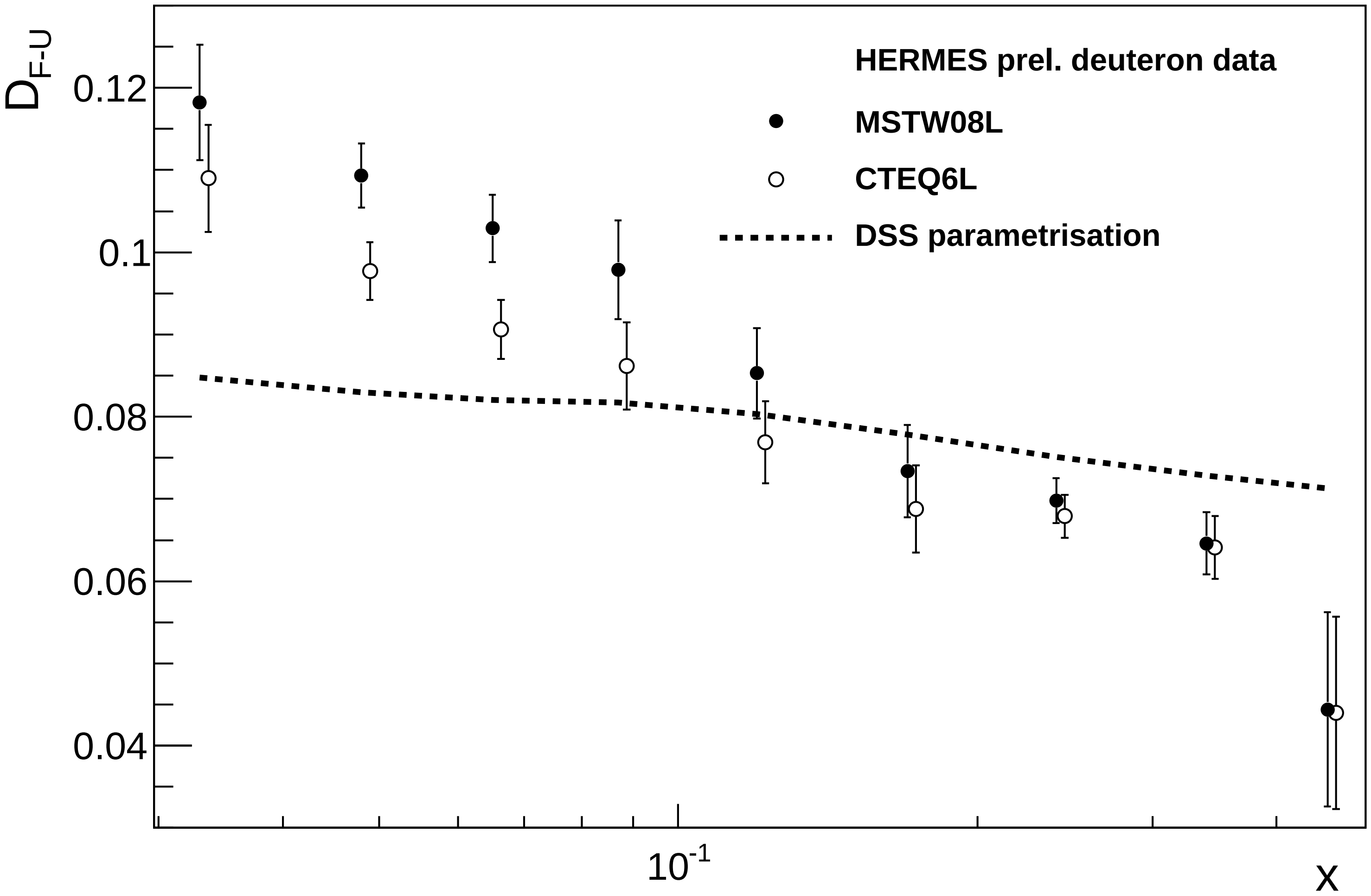
The Kaon Multiplicity Difference: $K^+ - K^-$

- reasons why the kaon multiplicity difference is important:
  - the contribution from strange quarks CANCELS in the difference
  - the gluon contribution cancels too $\rightarrow$ easier evolution in NLO
  - many experimental systematic errors cancel in the multiplicity difference
  - one have easy access to certain combination of FF, namely $D_{fav} - D_{unf}$
  - $\frac{dN^K_{diff}}{dN^{DIS}} = \frac{4(u_v+d_v)}{5Q+2S}(D_{fav} - D_{unf})$ - deuteron target!

The Multiplicity Difference vs Multiplicity Sum

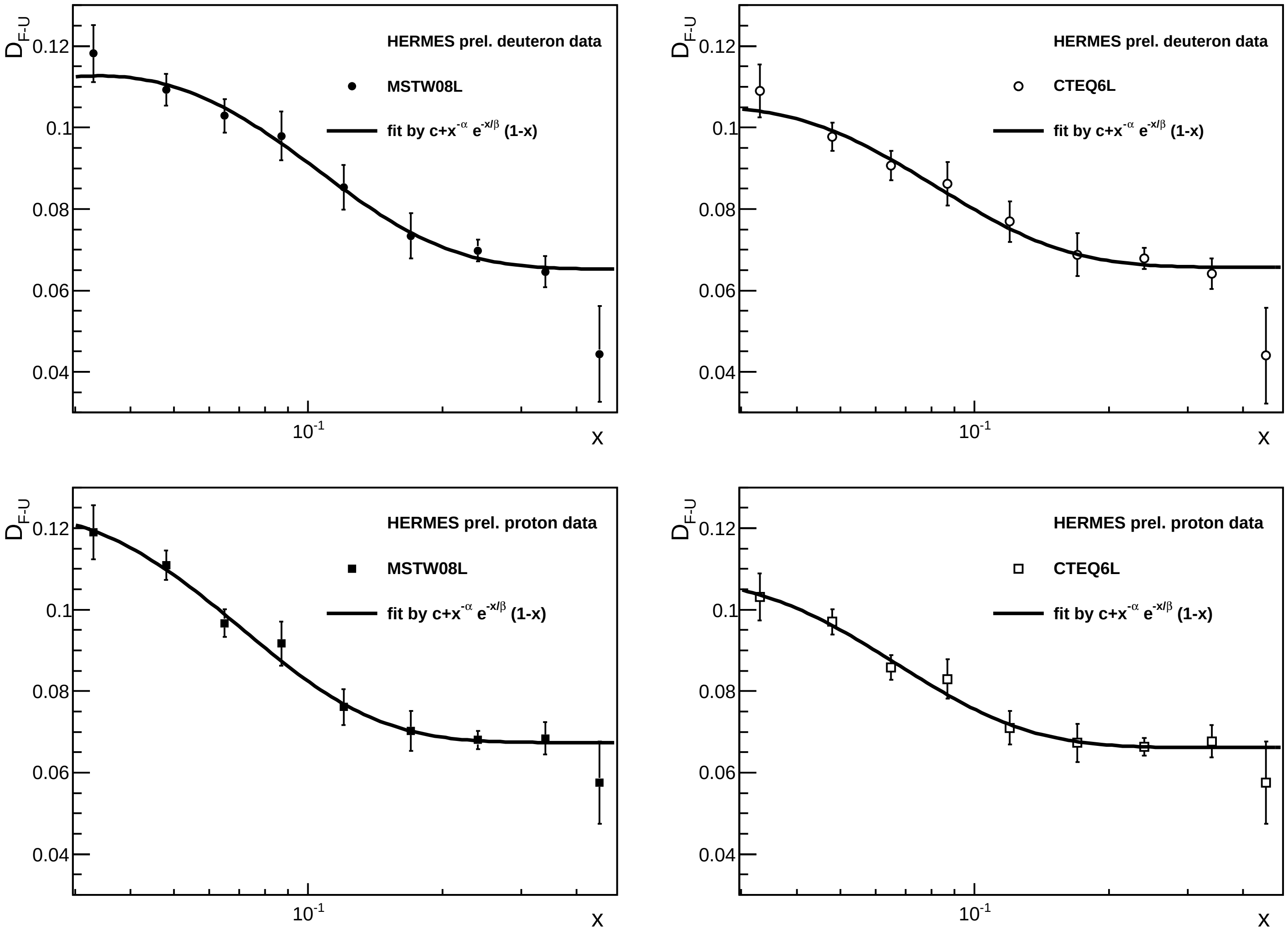
- to claim that the features observed by HERMES in the multiplicity sum are related to $S(x)$, one has to show that the multiplicity difference is well under control
- observe that in the multiplicity difference there is no contribution from strange quarks
- suppose that $(D_{fav} - D_{unf})(x_{low}) > (D_{fav} - D_{unf})(x_{high})$
  - D_{fav} increases - D_Q^K increases at low x! Less space for $S(x)$!
  - D_{unf} increases - D_Q^K decreases at low x more space for $S(x)$, however D_{unf} is rather small, cannot decrease too much
- $5\frac{dN^K(x)}{dN^{DIS}(x)} = \int D_Q^K(z)dz + S(x)/Q(x)\int D_S^K(z)$
- $D_Q^K = 4D_{fav} + 6D_{unf}$

HERMES Preliminary Results



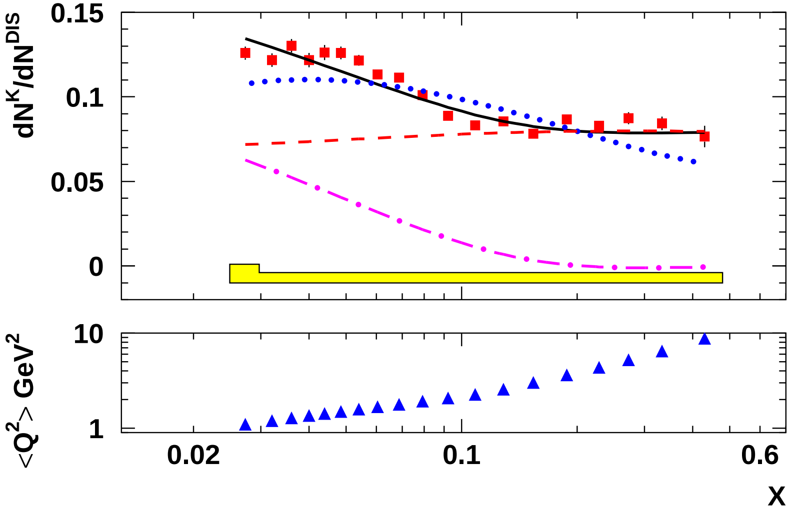
- $D_{fav} - D_{unf}$ is clearly not well under control!

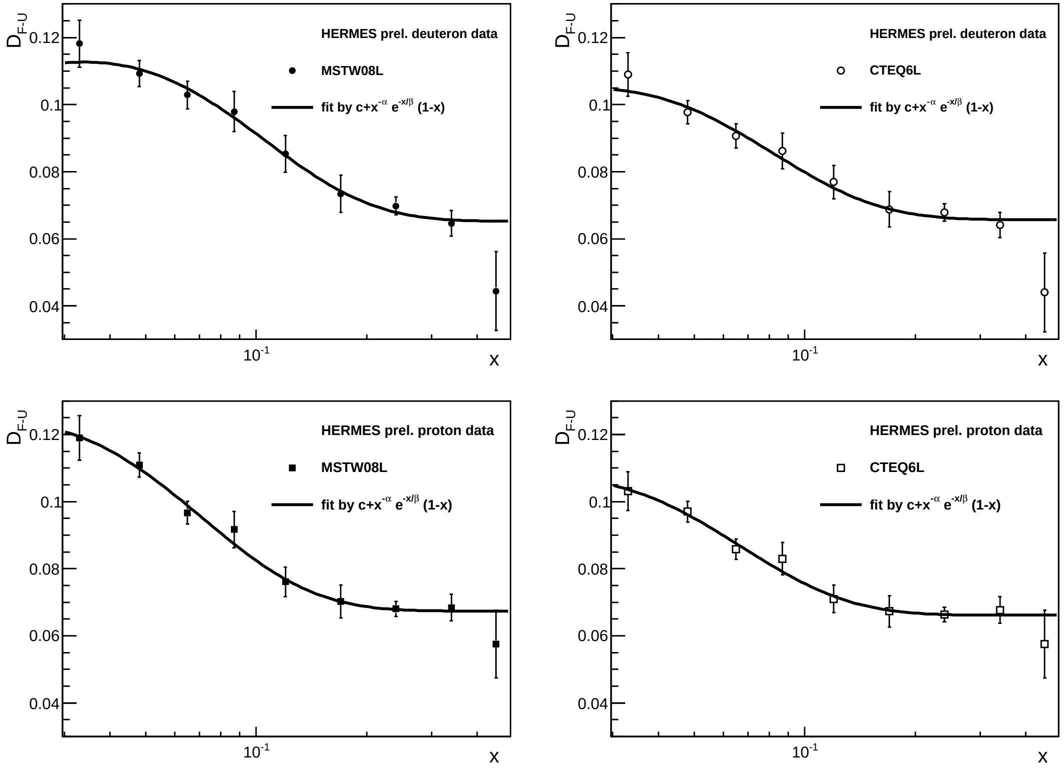
HERMES Preliminary Results cont.



- fit $D_{fav} - D_{unf}$ by the same functional form as used in HERMES to extract $S(x) \int D_{str}$ and $S(x)$ namely: $x^{\alpha} e - (x/\beta)(1-x) + const$!

Only Coincidence?





I doubt...

LO FF Fit...

- using HERMES preliminary results one can extract FF
- 1st try - no x dependence of FF...
- for comparison in the last column FF from DSS fit are given.

	using MSTW08L	using CTEQ6L	DSS
D_{fav}	0.100 ± 0.003	0.096 ± 0.003	0.091
D_{unf}	0.017 ± 0.002	0.018 ± 0.002	0.012
D_{str}	0.45 ± 0.09	0.50 ± 0.09	0.62
χ^2/ndf	75.4/15	57.1/15	–

- the obtained results are not so different from DSS fit
- χ^2/ndf are bad - data cannot be described in such a method
- this is the same conclusion as in the HERMES paper!

LO FF Fit cont.

- at this stage of analysis HERMES decided that the culprit is wrong $S(x)$ distribution!
- HERE: I assume that the problem in D_{fav}

	using MSTW08L	using CTEQ6L
D_{fav}	0.093 ± 0.003	0.092 ± 0.003
D_{unf}	0.027 ± 0.002	0.027 ± 0.002
D_{str}	-0.48 ± 0.15	-0.25 ± 0.15
α	-0.57 ± 0.04	-0.59 ± 0.06
β	0.039 ± 0.004	0.033 ± 0.005
χ^2/ndf	$9.7/13$	$8.7/13$

- large, by a factor 7-8 , improvement of χ^2/ndf

Impact of D_{fav} x Dependence on D_{str}

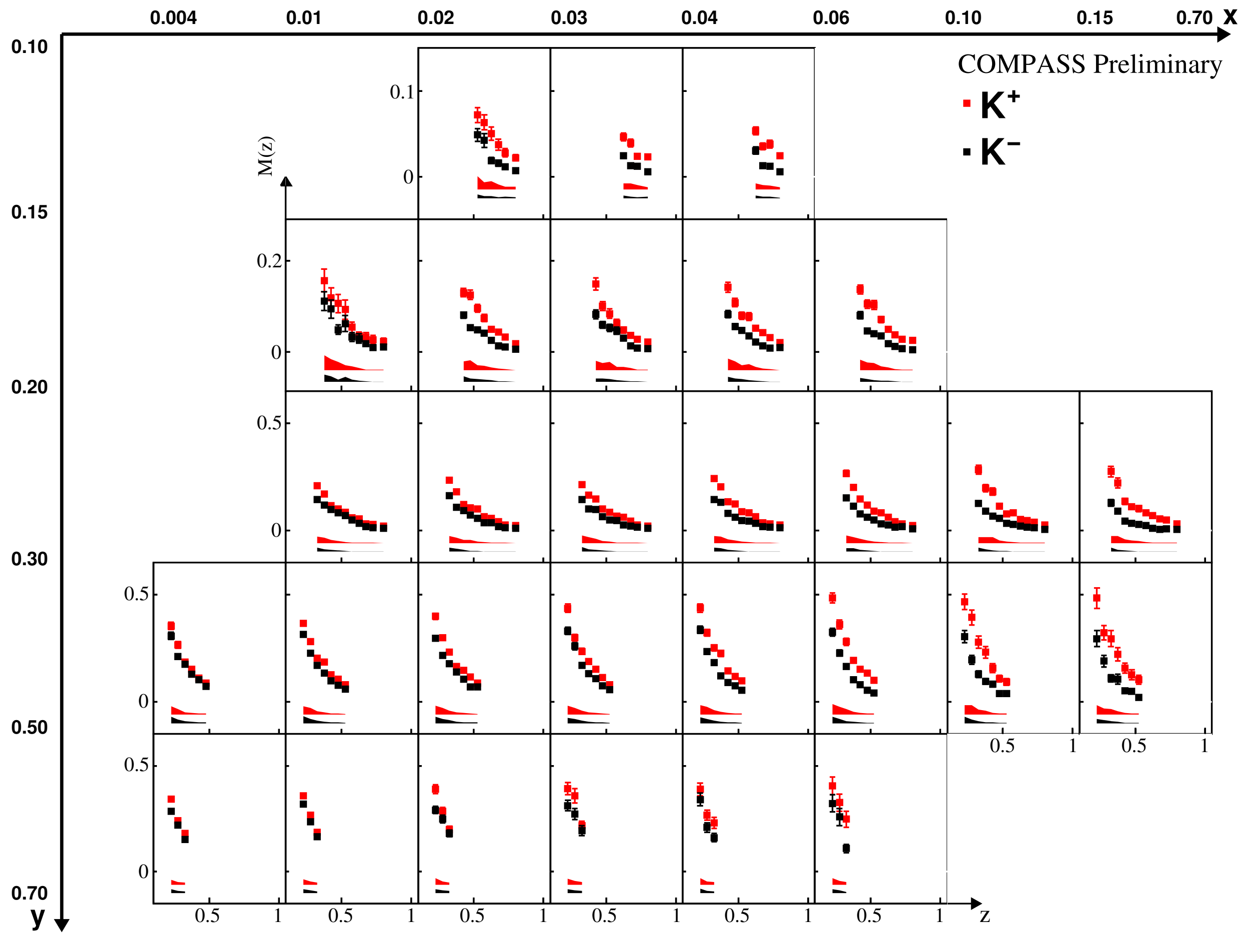
- large change of D_{str} as expected!
  - NOW: -0.48 ± 0.15 or -0.25 ± 0.15; previously $\approx +0.50$
  - assuming D_{unf} Q^2 dependence as in DSS, the value of D_{str} is increased by about 0.2-0.25
  - the overlap with physically allowed region is largely increased
  - however, large unphysical value of D_{str} may suggest that there is a problem in the HERMES preliminary multiplicities
- simultaneous fit of D_{fav} and D_{unf} decreased $\chi^2/ndf \approx 5.6/11$, but increases D_{str} uncertainty to about 0.8 - useless...
- Data where the multiplicity difference is not understood, hardly can be a reliable source of information about strange quarks!

The HERMES Way...

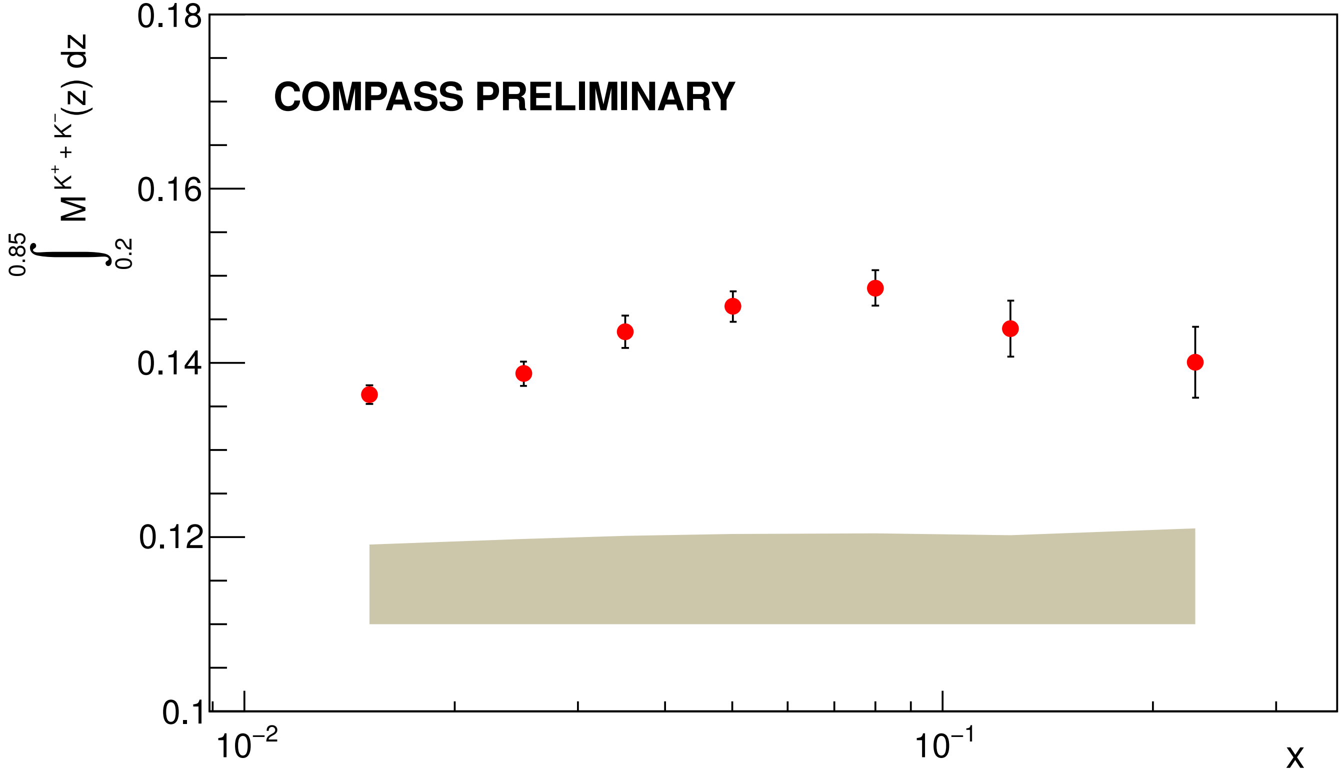
- what about HERMES way of doing analysis...
  - one can describe multiplicity sum assuming peculiar distribution of $S(x)$
  - however, since $S(x)$ do not contribute to multiplicity difference the peculiar shapes observed there are not affected!
  - to describe them one has to assume another peculiar distribution of D_{fav} and D_{unf}
  - moreover, a fine tuning of D_{fav} and D_{unf} parameters is needed so that, the peculiarities observed in the multiplicity difference do not bias $S(x)$ extracted from the multiplicity sum!
- The D_{fav} change simultaneously explains observed features in both multiplicity sum and difference! It is much simpler solution than the above!
- even simpler solution is a bug in the HERMES the multiplicities - why $D_{fav} - D_{unf}$ could have so strong x or Q^2 dependence?

COMPASS Multiplicities...

- COMPASS is on the way to extract h,π, K multiplicities
- some preliminary results are available

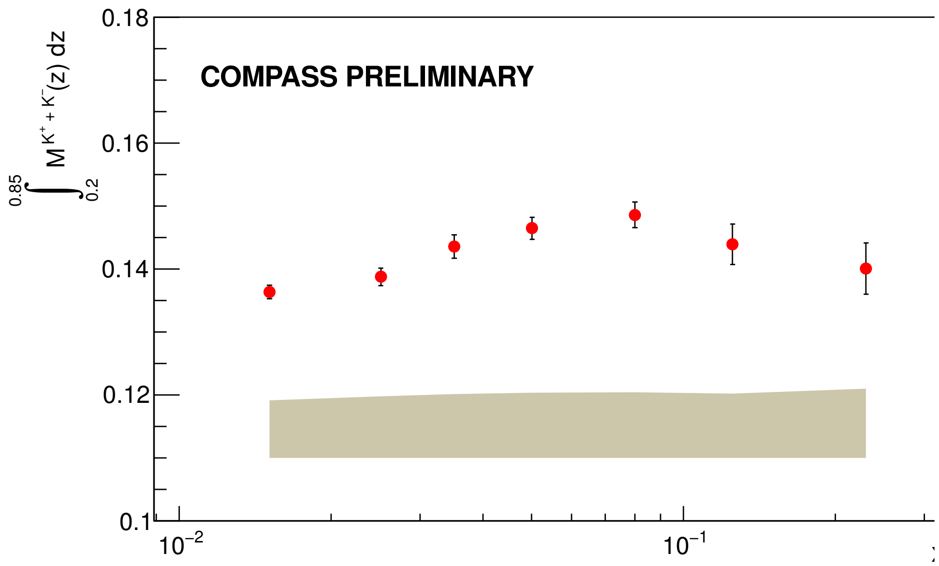


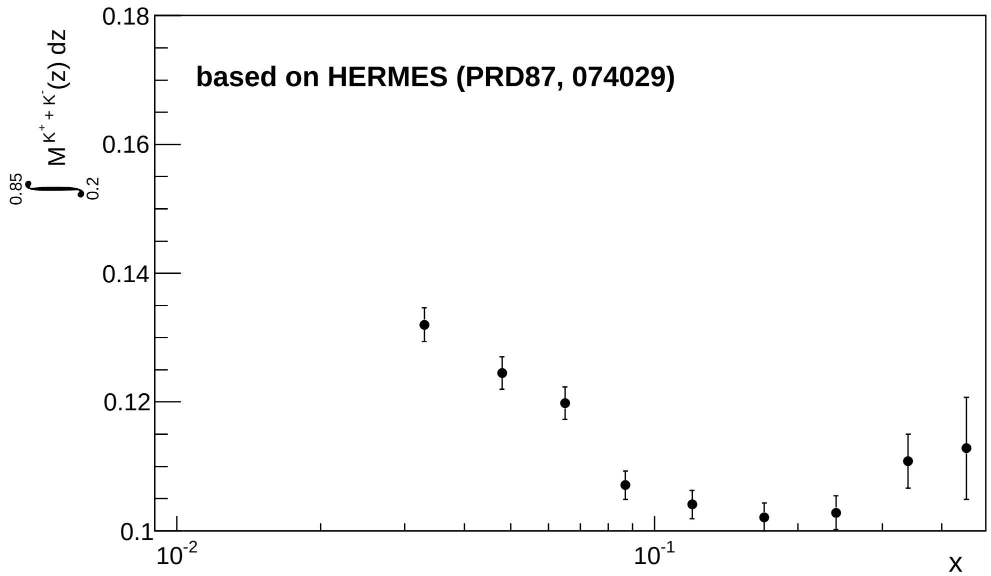
The Kaon Multiplicity Sum from COMPASS



- strong x dependence of the $M^{K^{+}+K^{-}}$ is not observed
- COMPASS analysis prefers low values of D_{str}
- low values of D_{str} $\rightarrow$ strange quark polarisation solved...

COMPASS vs HERMES - the Multiplicity Sum

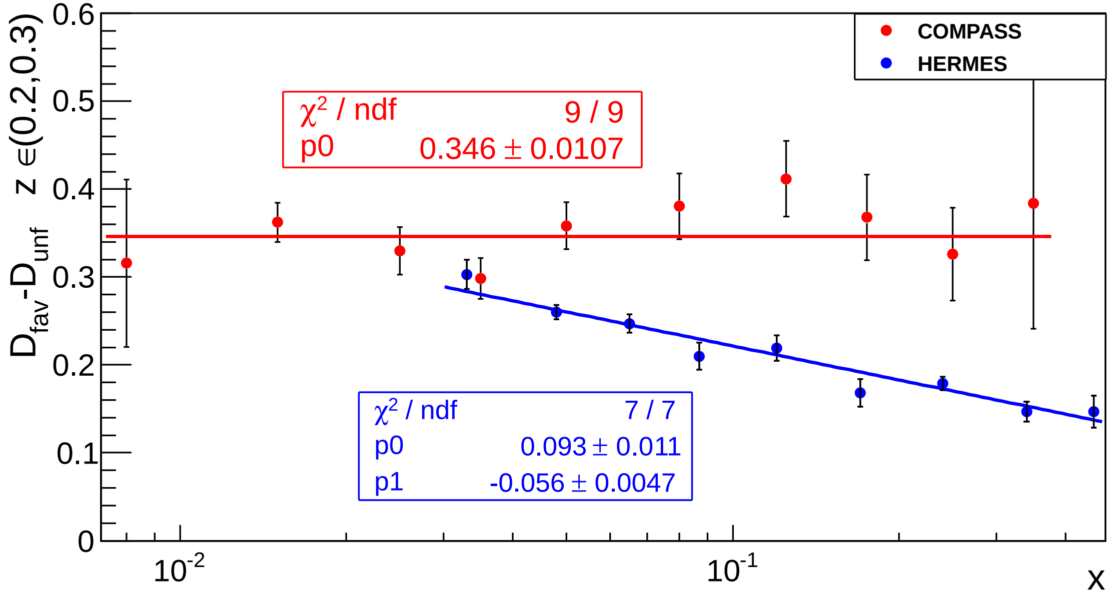




- clear discrepancy seen between HEREMS and COMPASS for $x > 0.1$
- BTW. here HERMES newly published data are presented!

COMPASS vs HERMES the Multiplicity Difference

- weak Q^2 dependence of $D_{fav} - D_{unf}$ expected from DSS
  - approx 2% dependence for $Q^2 \in (1-30)$ GeV^2 and $z \in (0.2-0.3)$
- older COMPASS preliminary data (2012)
- HERMES preliminary one
- error where scaled to obtain $\chi^2/ndf = 1 \leftarrow$ systematic cancellation in the multiplicity difference
- COMPASS D_{F-U} values are flat, contrary to the HERMES ones...



Summary

- the strange quark polarisation is expected to be negative for all values of x
- such a behaviour is not observed while analysing kaon asymmetries
- however, lower than anticipated in DSS fit values of D_{str}/D_{fav} FF can explain the puzzle
- problems seen on the experimental side
- preliminary COMPASS results on kaons multiplicities DO NOT agree with HERMES results
- IMHO: HERMES results due to certain peculiarities might not be a reliable source of information about strange quarks