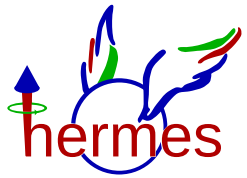


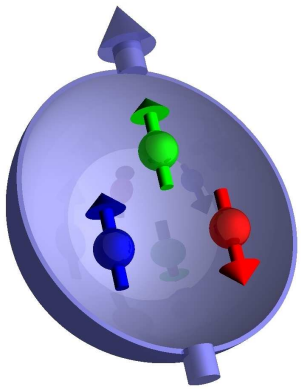
The Hadronic Structure Investigated By HERMES

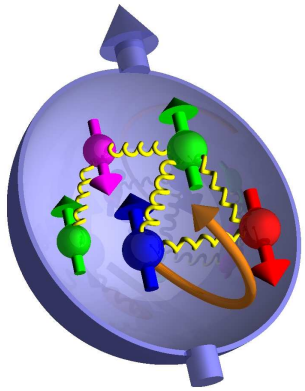
Tom Feusels (Belgium)
Brecht Verstichel (Belgium)
Anna Palasciano (Italy)
Nora Estrada (Mexico)
Xianguo Lu (China)

U.A.S.L.P.

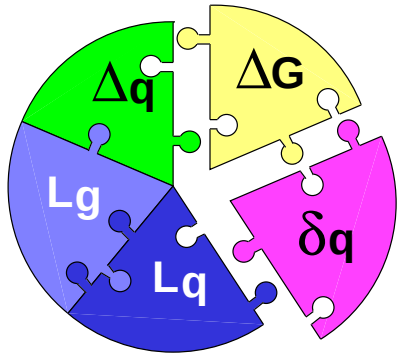
DESY Summer Students Session
September 18th 2006

HERMES Physics





$$\frac{s_z^N}{\hbar} = \frac{1}{2} = \frac{1}{2}\Delta\Sigma + L_z^q + J_G$$

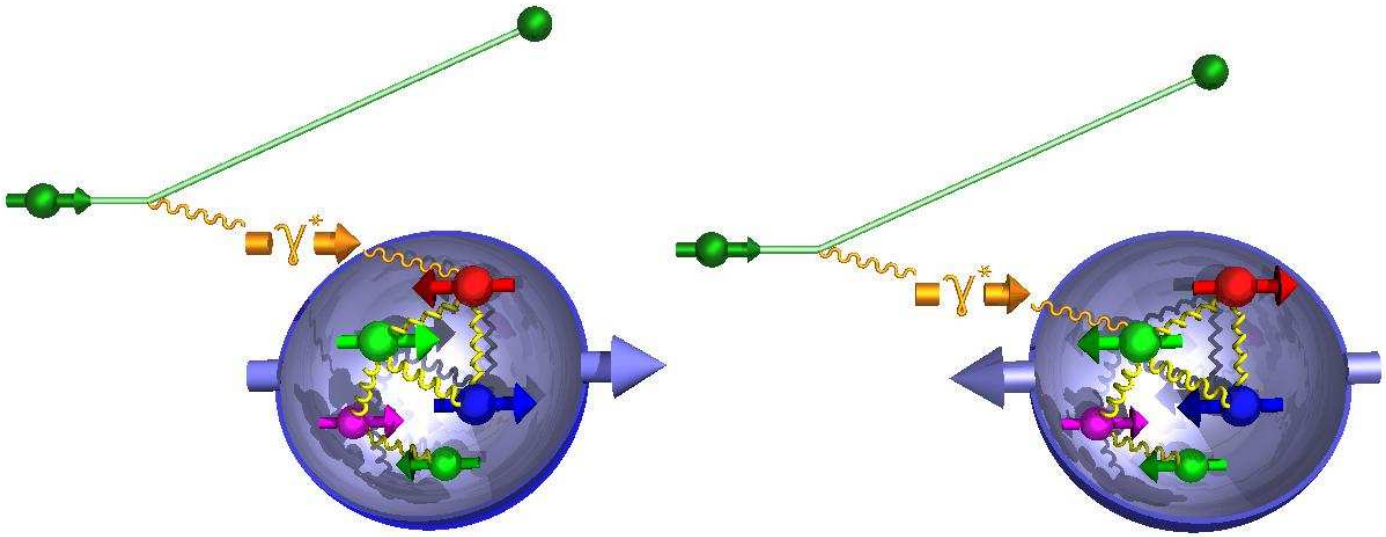


HERMES provides:

- Detailed information about $\Delta\Sigma$ and its decomposition
- First indication of $\Delta G/G$
- First attempts to measure L_z^q

Principle Of Polarized Scattering Experiments

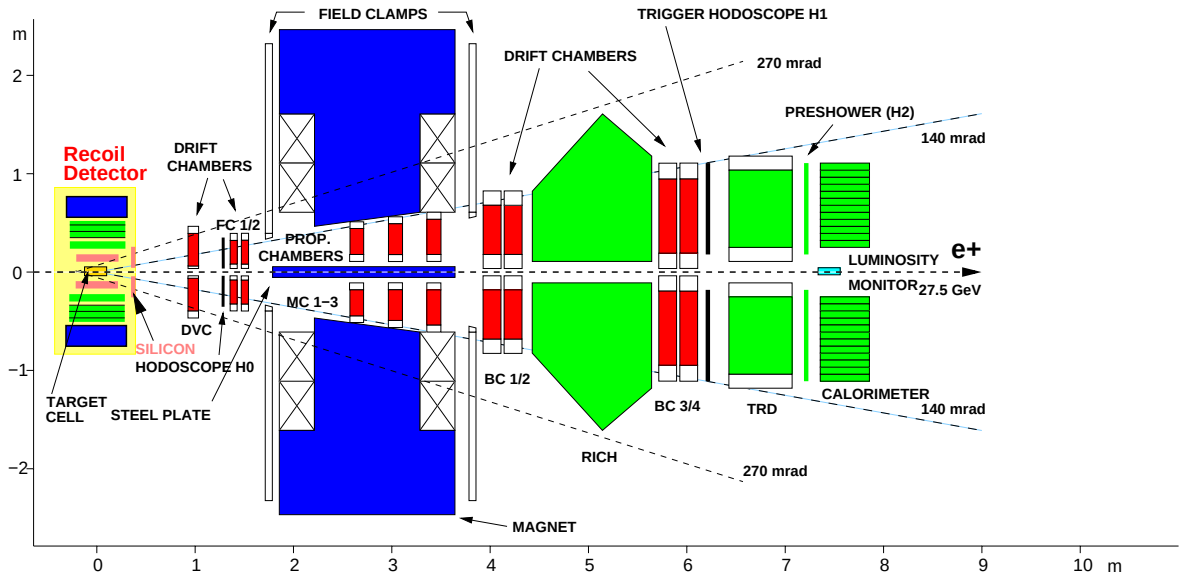
Due to angular momentum conservation a photon with a certain helicity can only be absorbed by a quark with an orientation antiparallel to the photon spin (quarks has spin $\frac{1}{2}$)



Measurement of cross section asymmetries, e.g. $A_{||} = \frac{\sigma^{\Leftarrow} - \sigma^{\Rightarrow}}{\sigma^{\Leftarrow} + \sigma^{\Rightarrow}}$ Parallel and antiparallel beam('$\rightarrow$') and target('$\Rightarrow$') polarizations

HERMES Experiment

- DIS of longitudinally polarized positrons (27.6 GeV)



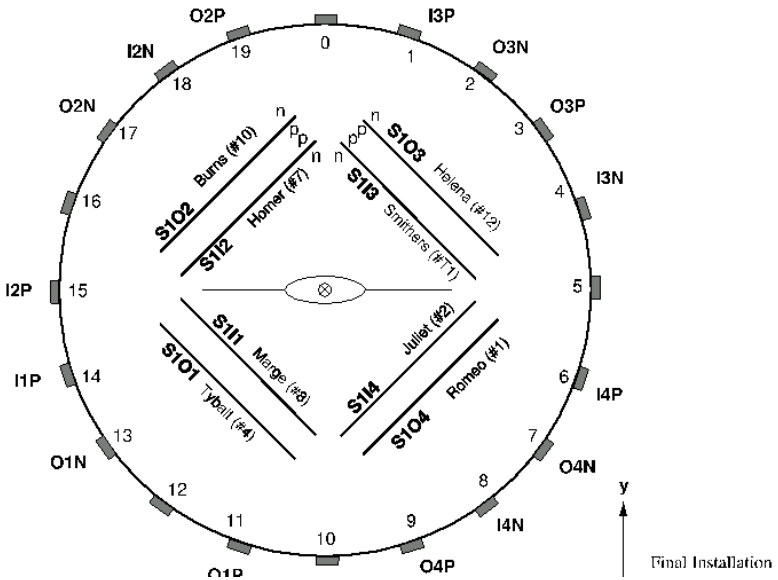
- Polarized (1995-2005) and solely unpolarized (2006) gas target
- Forward magnetic spectrometer with precise momentum and angle resolution.
- Very clean separation of the scattered lepton track from hadron track with an efficiency exceeding 98 %.

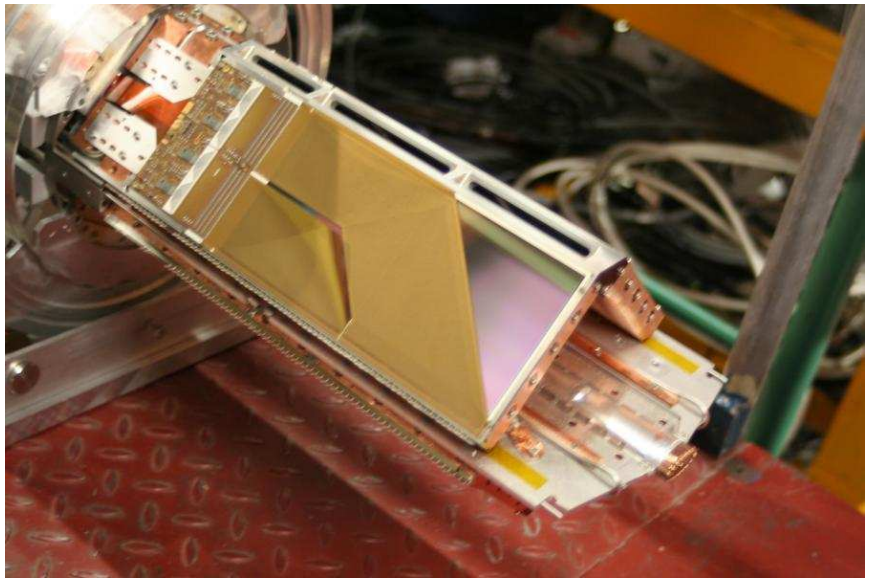
Search For A Proton

Tom Feusels

The Silicon Detector

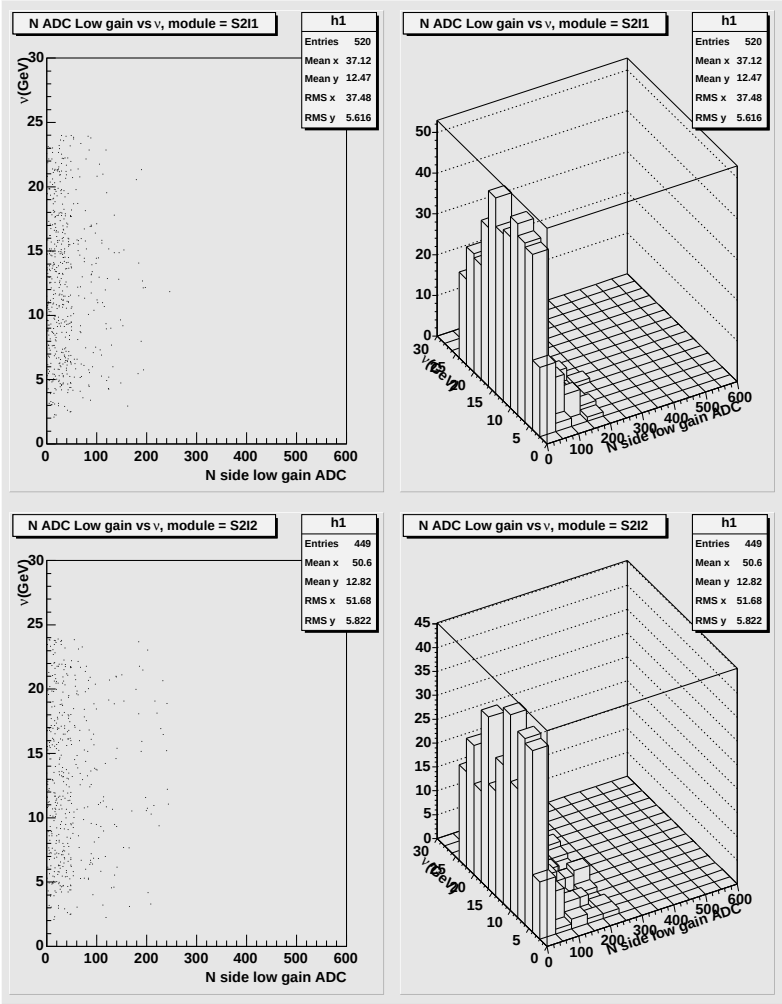
Energy deposition of recoil protons to determine their momenta.



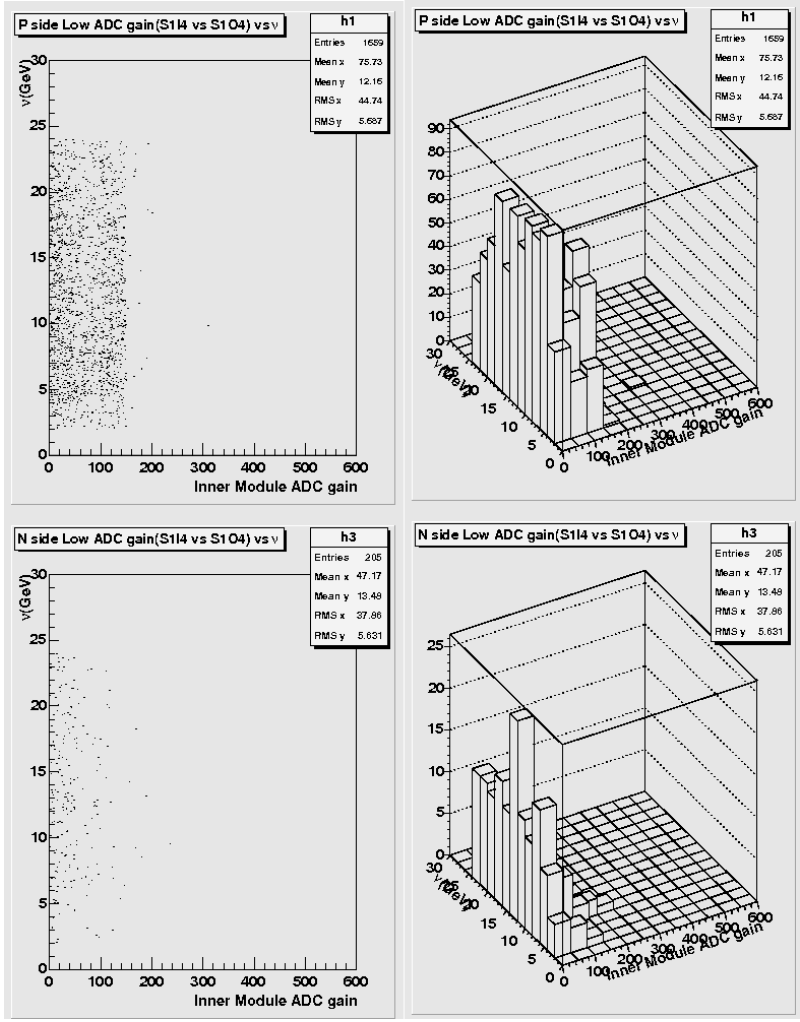


To determine low and high proton momenta, one uses low gain and high gain.

Results



n-side low gain vs ν



Inner module vs ν

The Analysis Of MIP Signals In The Preshower

Brecht Verstichel

The Preshower

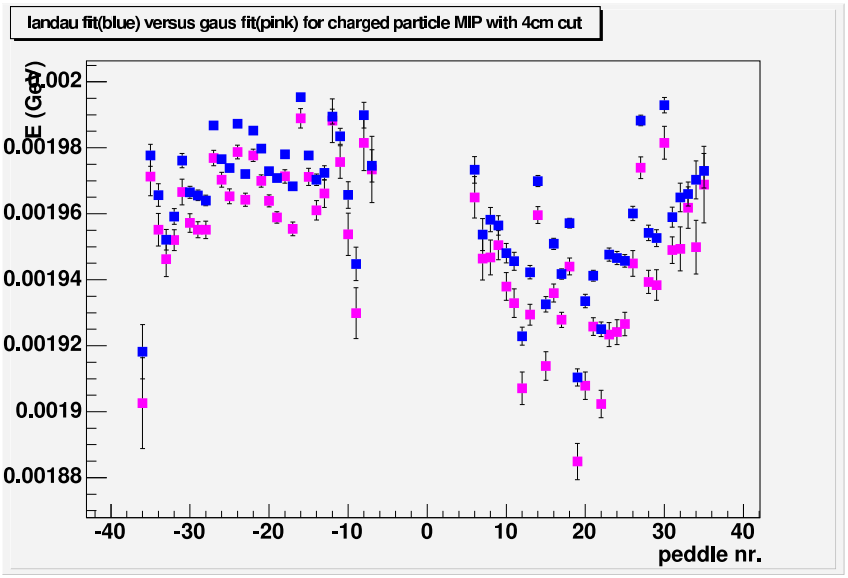
Fast triggering, PID by differentiating electrons from hadrons.

Study of the preshower calibration is important for the correct reconstruction of photon energy.

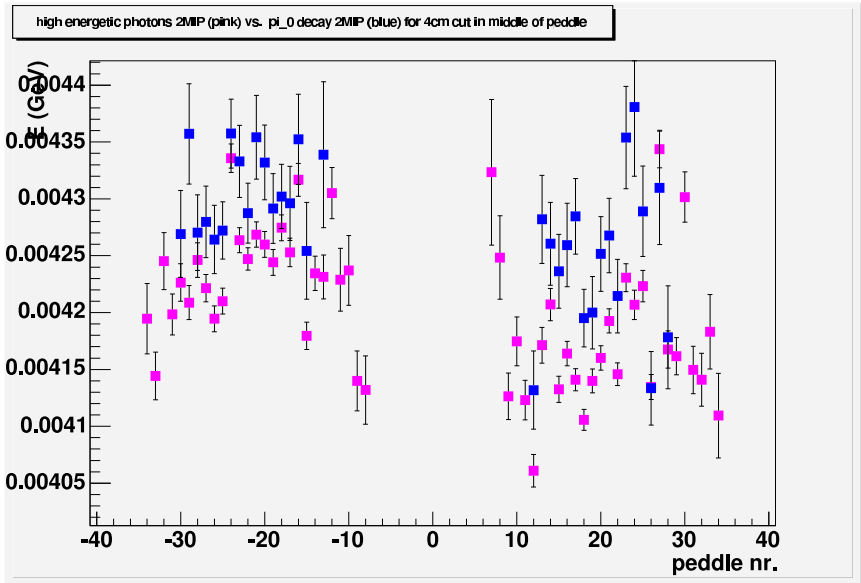
Photons that come into the calorimeter might already have lost some energy in the preshower.

Results

Checked the 1 MIP and the 2 MIP peak (bethe bloch)



The 1MIP gaussian versus landau comparison



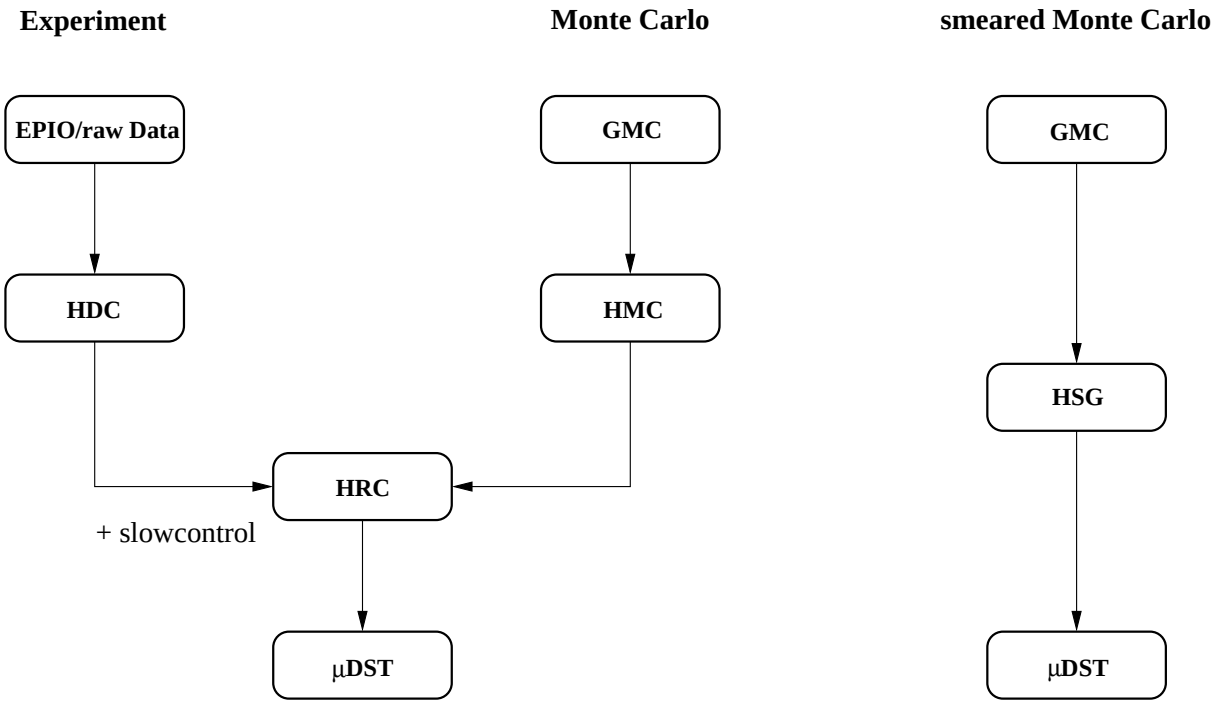
The 2MIP π^0 versus high energetic photons cut comparison

An Improved Loss Function For Photons And Neutral Pions For HSG

Anna Palasciano

HERMES Monte Carlo

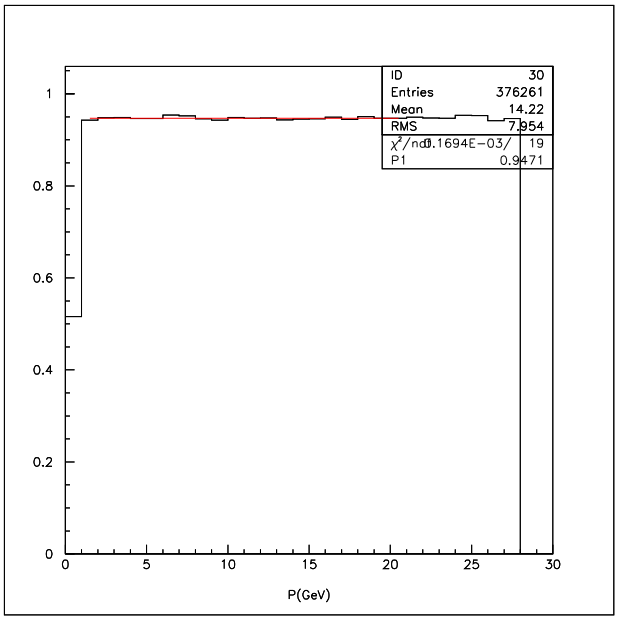
HERMES Smearing Generator is a fast replacement for full detector simulation and tracking

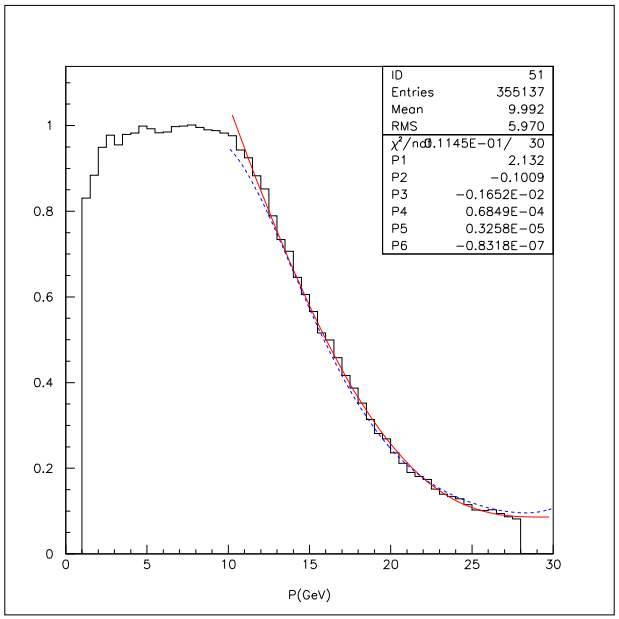


- Smears the Monte Carlo kinematics of track (P, θ_x, θ_y) based on look-up table
- Takes into account particle losses: tracking inefficiencies, interaction with detector material→ loss function.

Results

Loss function as a function of the photon energy.





Gamma loss function

π^0 loss function

L, T Separation Of Transverse Target Spin Asymmetry, A_{UT}, In Exclusive Rho Production

Nora Estrada

GPDs and A_{UT}

GPD's

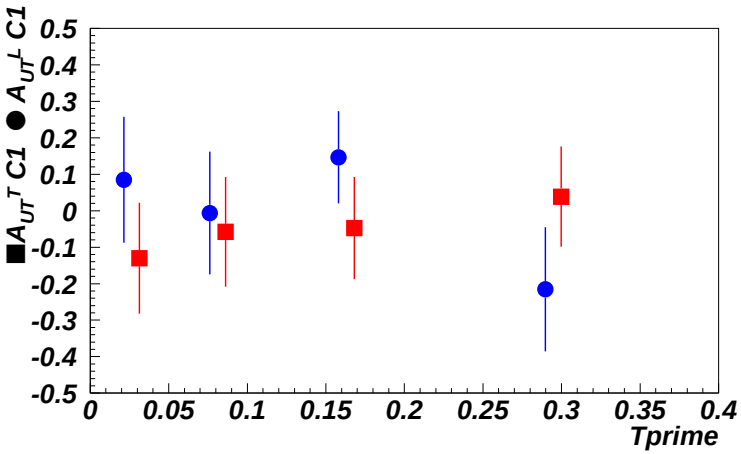
3-D description of nucleon

- $A_{UT} = \frac{\sigma^{\uparrow\Uparrow} - \sigma^{\uparrow\Downarrow}}{\sigma^{\uparrow\Uparrow} + \sigma^{\uparrow\Downarrow}}$
- $A_{UT}^{\sin(\phi-\phi_s)}$ Sensitive to $J_q = \frac{1}{2}\int x(H_q + E_q)dx$

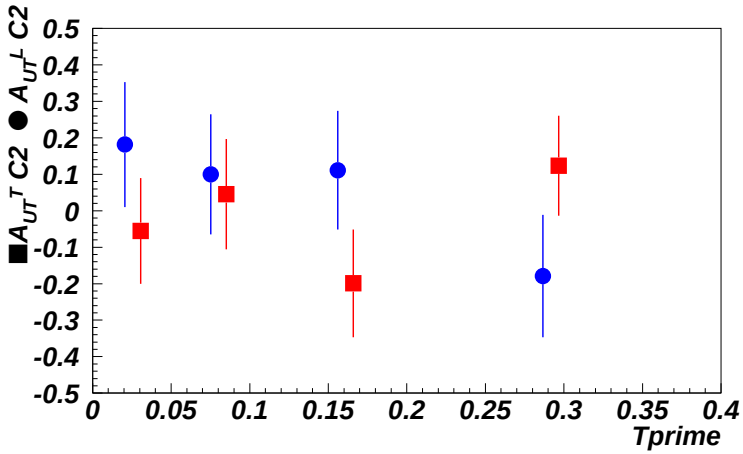
We contribute releasing the moment $A_{UT}^{sin(\phi-\phi_s)}$ for the process $\gamma^\star p^\uparrow \to \rho^0 p$, separated over ρ_L^0 and ρ_T^0, using the latest data produced by HERMES.

Results

We separate the L and T contributions with a method that use the decay angle θ of the π^+ to get information about the longitudinal polarization of the ρ^0 meson.



TMC1, blue: A_{UT}^L, red: A_{UT}^T

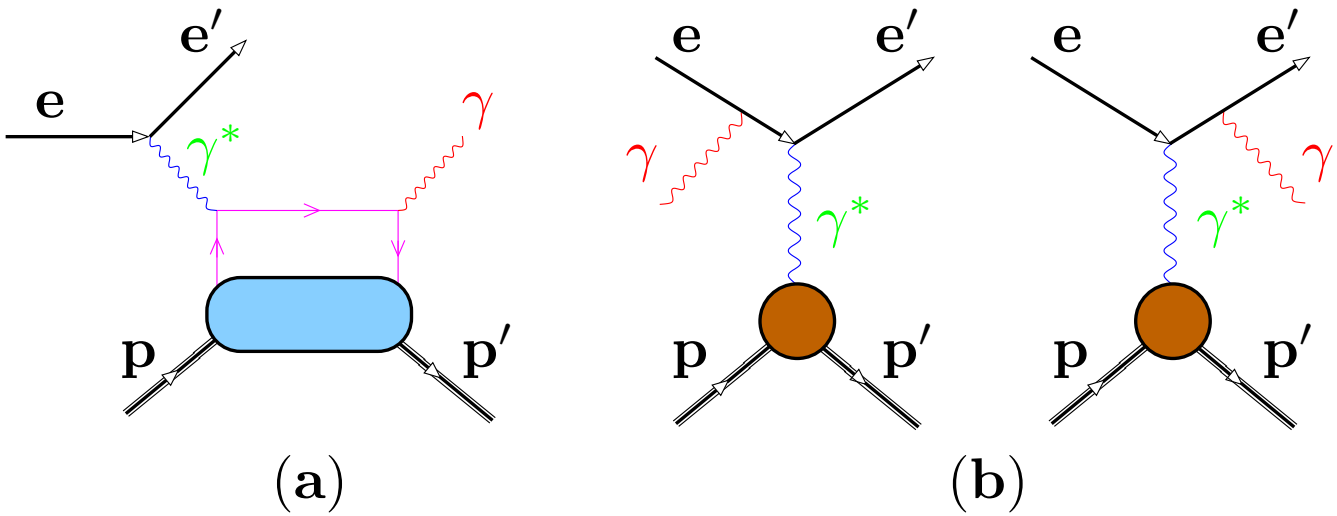


TMC2, blue: A_{UT}^L, red: A_{UT}^T

Beam Charge Effect On Beam Spin Asymmetry Associated with DVCS On The Proton

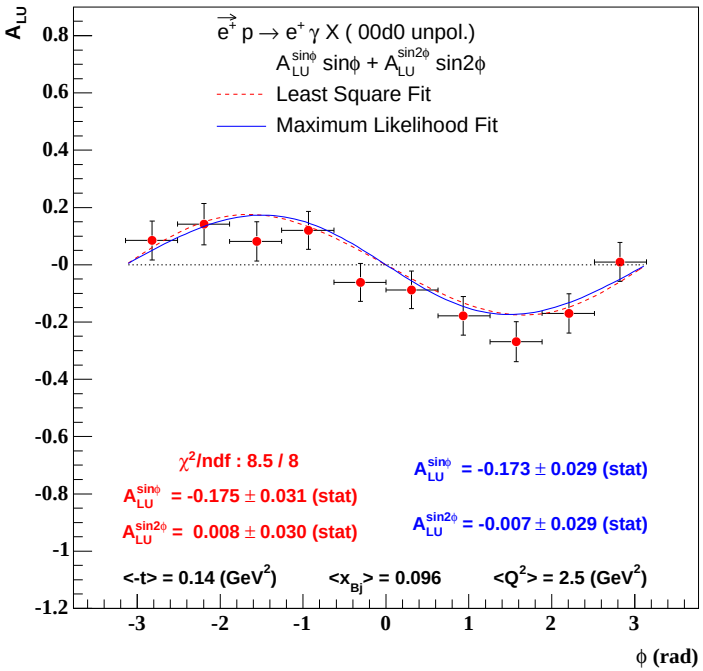
Xianguo Lu

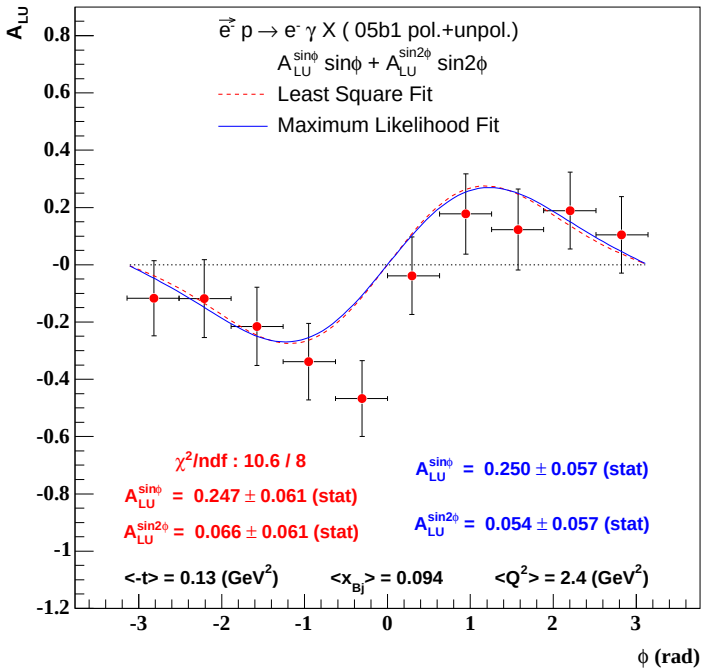
Theoretical calculation reveals that Beam Spin Asymmetry (BSA) in Deeply Virtual Compton Scattering (DVCS) on nuclei depends on the beam charge.



The $sin\phi$ moments of the BSA defined in the case with longitudinally polarized beam and unpolarized target, satisfy $|A_{LU}^{sin\phi,e^+}| \neq |A_{LU}^{sin\phi,e^-}|$, $A_{LU}^{sin\phi,e^+} \simeq -A_{LU}^{sin\phi,e^-}$.

Preliminary result $A_{LU}^{sin\phi,e^+} \simeq -A_{LU}^{sin\phi,e^-}$ can be concluded within statistical uncertainties. Also, kinematics-dependence of BSA has been studied.





DVCs is the most cleanest approach to GPDs

Thanks...!

GRACIAS...!

grazie...!

DANKE...!