HK 33.4

Polarization transfer coefficients in ^{12}C and ^{120}Sn using inelastic proton scattering at 0° *

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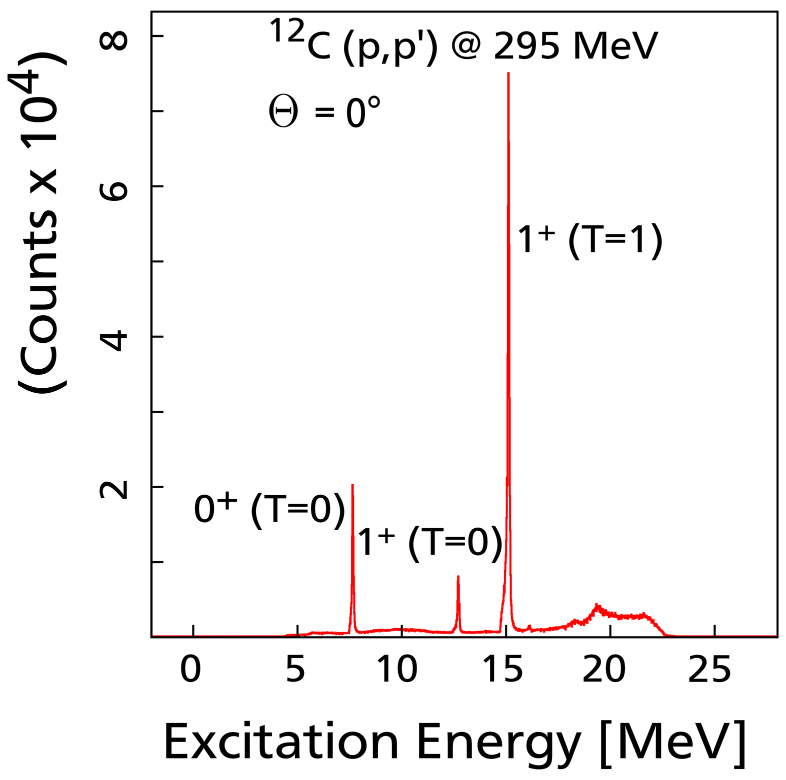
Motivation

- Polarization transfer coefficients (PT) as a tool for the study of spin-isospin structure
- Compare with similar experiment at 392 MeV [1]
- Consistency check for a series of experiments performed at 295 MeV

- Present experiment: Determination of PT coefficients of 0⁺ (T=0), 1⁺ (T=0, T=1) states in ^{12}C
- Total spin transfer $\sum = \frac{3-(D_{NN}+D_{SS}+D_{LL})}{4}$
- At 0°: spinflip / non-spinflip separation

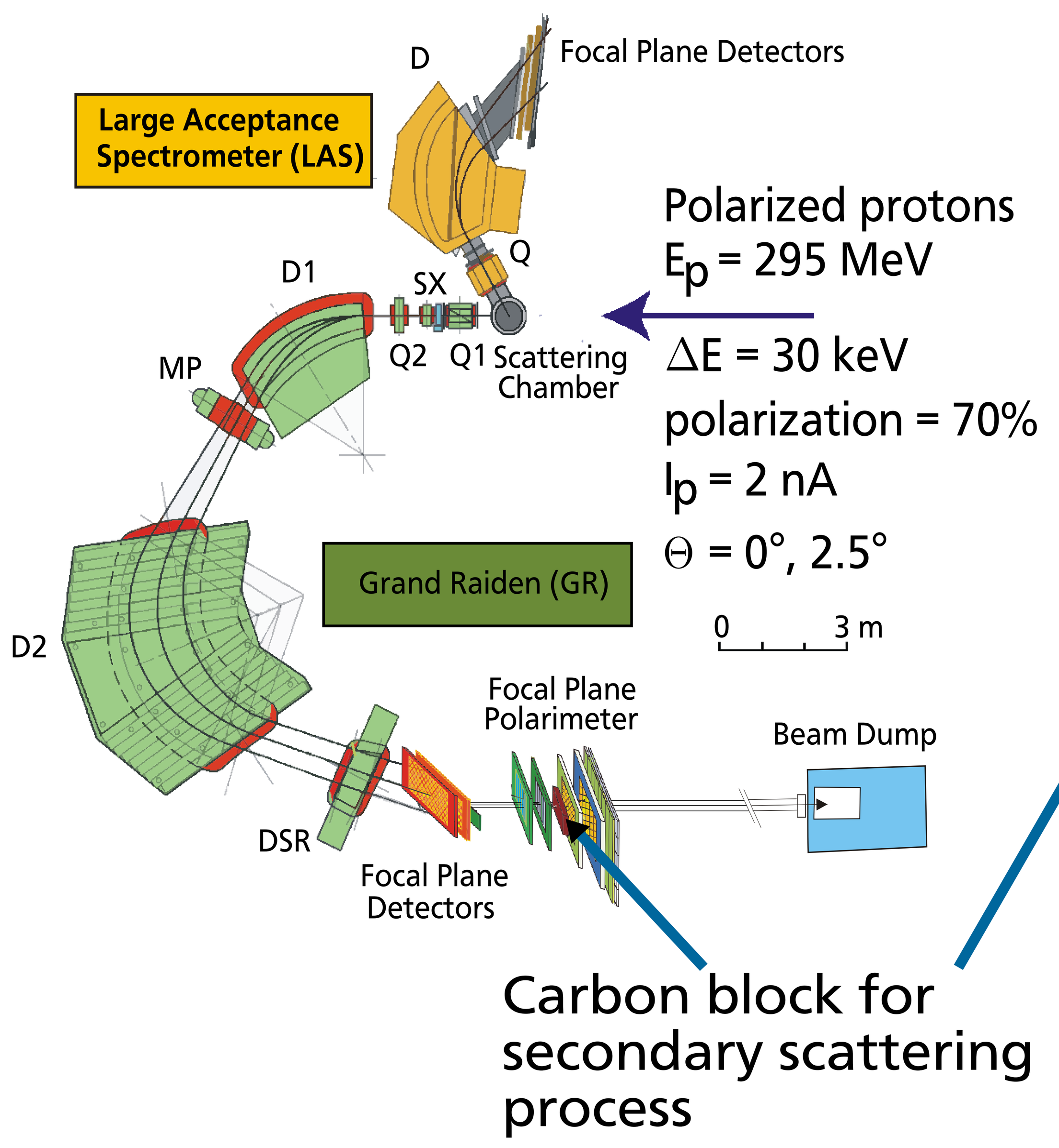
$$\sum = \frac{3-(2D_{SS}+D_{LL})}{4} = \begin{cases} 0, & \Delta S = 0 \\ 1, & \Delta S = 1 \end{cases}$$

with $D_{NN} = D_{SS}$



($\vec{p}$,$\vec{p}$') Experiments at RCNP

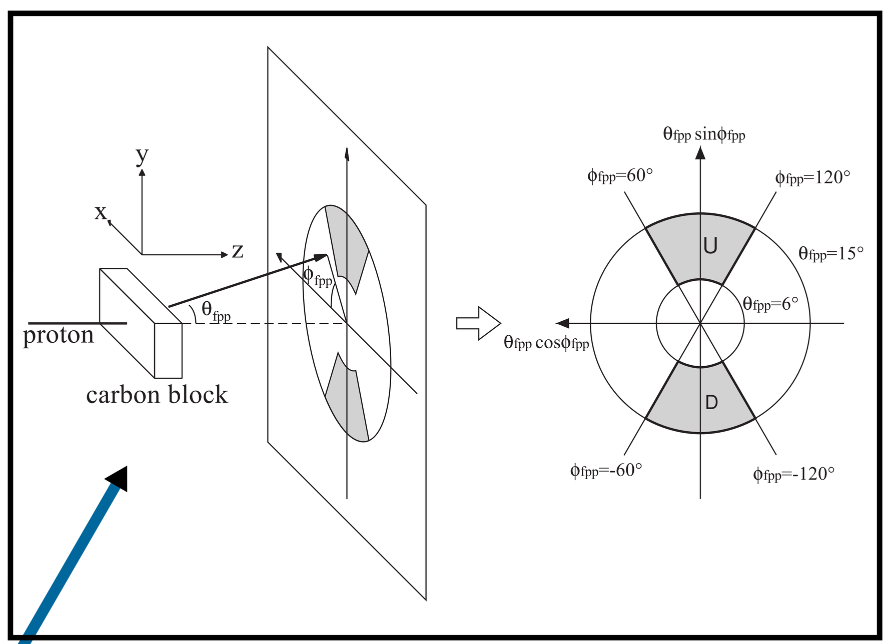
Experimental setup



- Measurement at 0°: D_{LL} (2008) & D_{SS} (2009)

Extraction Methods for D_{SS} and D_{LL}

Sector Method [2]



- $p_x^{fpp} = \frac{1}{\langle A_y\rangle^{fpp}} \frac{1-\alpha^{fpp}}{1+\alpha^{fpp}}$ with $\alpha^{fpp} = \sqrt{\frac{N_U^{\uparrow}\cdot N_D^{\downarrow}}{N_D^{\uparrow}\cdot N_U^{\downarrow}}}$

Estimator Method [3]

- Unbiased efficient estimator $\hat{\varepsilon} = \begin{pmatrix}\hat{\varepsilon}_n \\ \hat{\varepsilon}_s\end{pmatrix}$

$\hat{\varepsilon}_n \simeq \varepsilon_n = p_n'' \langle A_y\rangle^{fpp} \qquad \hat{\varepsilon}_s \simeq \varepsilon_s = -p_s'' \langle A_y\rangle^{fpp}$

- $\hat{\varepsilon} = F^{-1}B$ with $B = \begin{pmatrix}\Sigma\cos(\varphi_{fpp}) \\ \Sigma\sin(\varphi_{fpp})\end{pmatrix}$

$$F = \begin{pmatrix}\Sigma\cos^2(\varphi_{fpp}) & \Sigma\cos(\varphi_{fpp})\sin(\varphi_{fpp}) \\ \Sigma\cos(\varphi_{fpp})\sin(\varphi_{fpp}) & \Sigma\sin^2(\varphi_{fpp})\end{pmatrix}$$

- Statistical uncertainties are calculated from the covariant matrix $V(\hat{\varepsilon}) = F^{-1}$
- $\frac{\varepsilon_s^t}{\varepsilon_s^b}$ with $\varepsilon_s^t = -p_s''^t \langle A_y\rangle^{fpp}$ & $\varepsilon_s^b = -p_s''^b \langle A_y\rangle^{fpp}$

- Analyzing power of Focal Plane Polarimeter $\langle A_y\rangle^{fpp}$
- $p_s''^t = \cos(\theta_p) D_{SS} p_S + \sin(\theta_p) D_{LL} p_L$

Assumption: No depolarization of background events $D_{SS} = D_{LL} = 1$

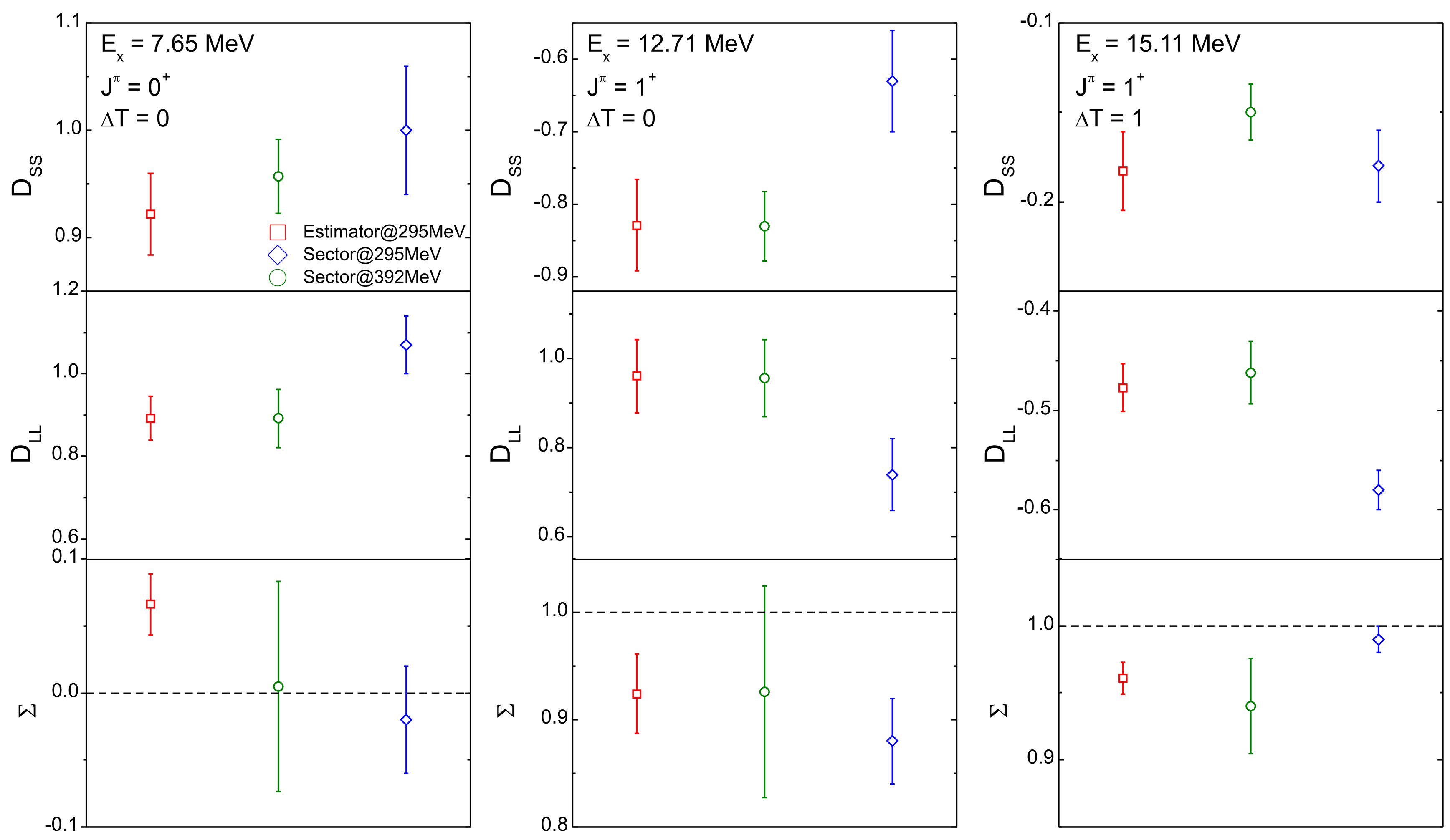
$p_s''^b = \cos(\theta_p) p_S + \sin(\theta_p) p_L$

- Easiest evaluation method
- Only a part of the data is used
- Number of data in U-D regions are additive

- Close to the maximum use of the data
- Sums in definition of estimator are additive

First results, summary and outlook

Comparison of estimator & sector method for 295 MeV & 392 MeV



Summary

- Consistency check of the experimental method

Outlook

- Application to data in ^{208}Pb and ^{120}Sn
  - → HK 3.1 - Iryna Poltoratska
  - → HK 50.4 - Anna Maria Heilmann
- Future Goal: Spin M1 Resonance and PDR in the deformed nucleus ^{154}Sm

References

- [1] A. Tamii et al., Phys. Lett. B 459 (1999) 61.
- [2] A. Tamii et al., NIM A 605 (2009) 326.
- [3] D. Besset et al., NIM 166 (1979) 515.

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