NN Korrelationen in Kernen untersucht durch Photoemission von Nukleonenpaaren*

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- NN-Korrelationen und 2N-Knockout
  - Einleitung und Zugang
  - Ergebnisse bisheriger Experimente
- ^{4}He($\vec{\gamma}$,NN) Experiment
  - Polarisation und Bremsstrahlung
  - Experiment Aufbau
  - Detektor Kalibration und Teilchenseparation
- Photon Asymmetrie

Zusammenfassung

*supported by DFG(Schwerpunkt/Graduiertenkolleg),DAAD,NATO

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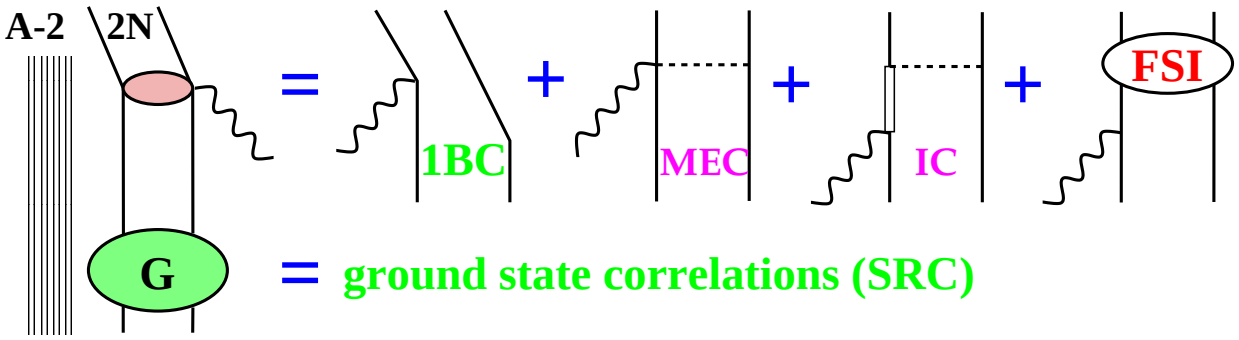
NN Correlations and Photo Absorption

Approach to SRC via exclusive 2N emission

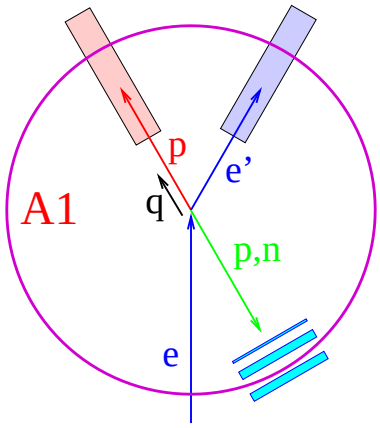


virtual photon: $(e, e'pp/pn)$

- superparallel kinematics: MEC=0, IC=0 for σ_L

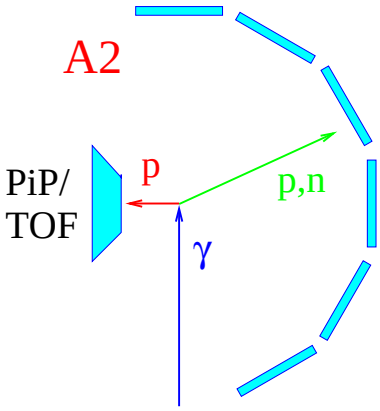
$\rightarrow$ direct approach to central SRC

But: Fermi motion of pair: $\vec{q} \neq \vec{p}_N$
Xsec very small



real photon: $(\gamma, pp/pn)$

- Coincident, high resolution measurement over wide angle and E_γ range
- Real (transversal) photons sensitive on larger tensor SRC
- MEC/IC can be suppressed via kinematics and isospin
  (M. Heim et.al., Tübingen, following talk)



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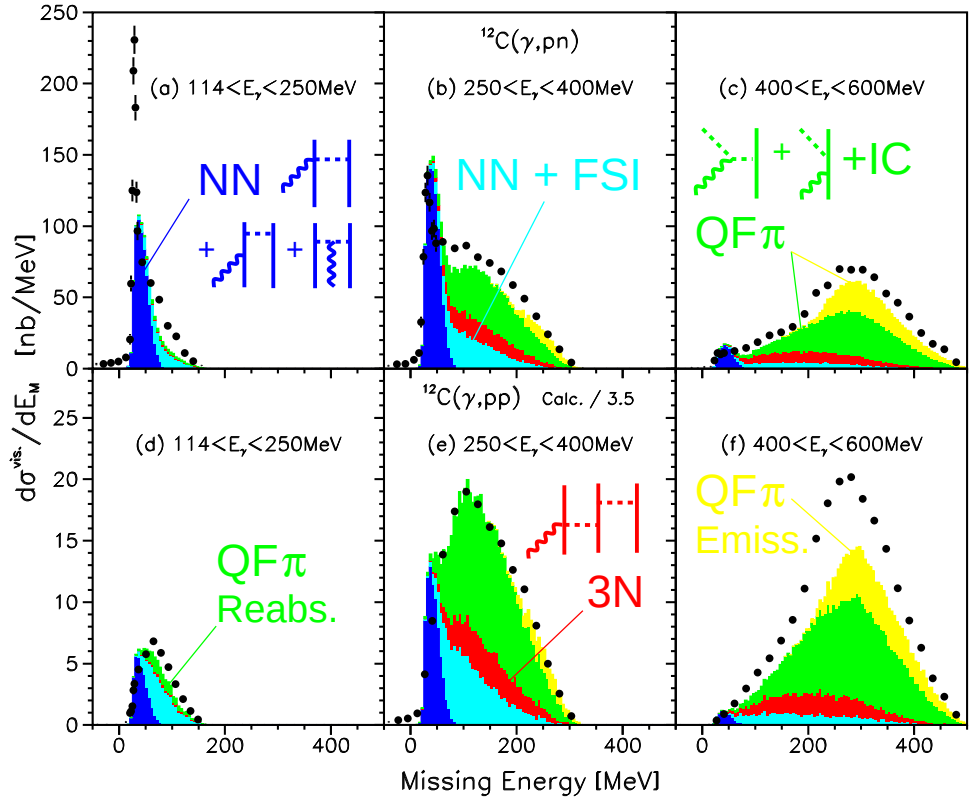
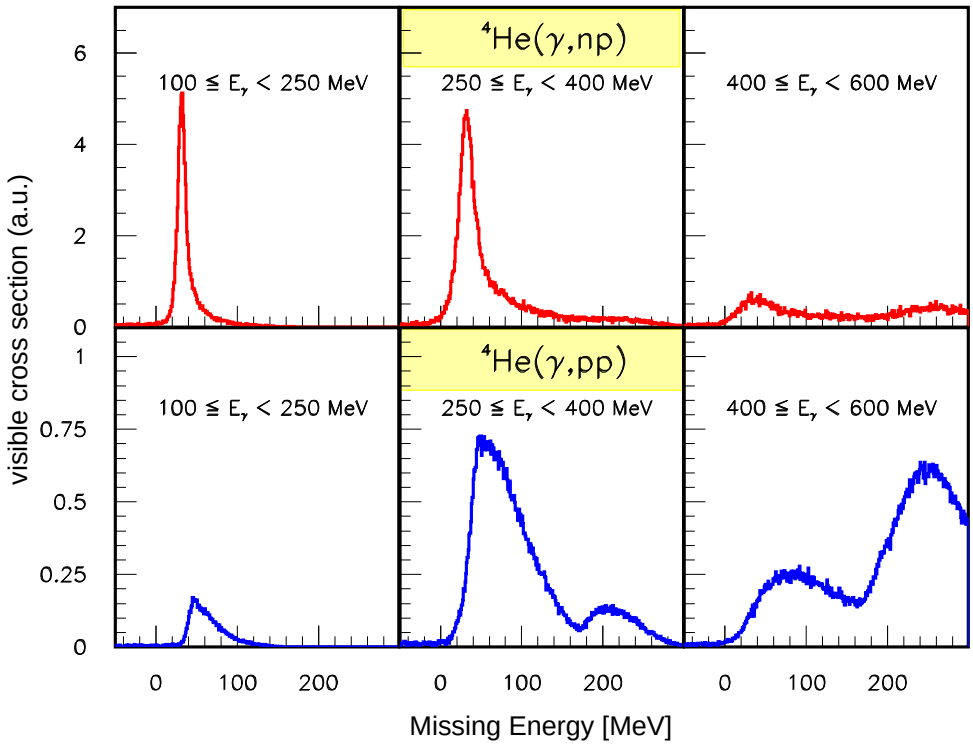
$^{12}C/^{4}He$: Reaction Mechanisms





$E_{2m} = E_x - Q$

T. Lamparter
Z. Phys. A
355 (96) 1

T. Hehl
Prog. Part.
Nucl. Phys.
34 (95) 385

Carrasco,
Oset
Nucl. Phys.
A
536 (92) 445

Less FSI and π production

2N absorption dominant

(high central density)

E_{2m} used to enhance direct 2N absorption

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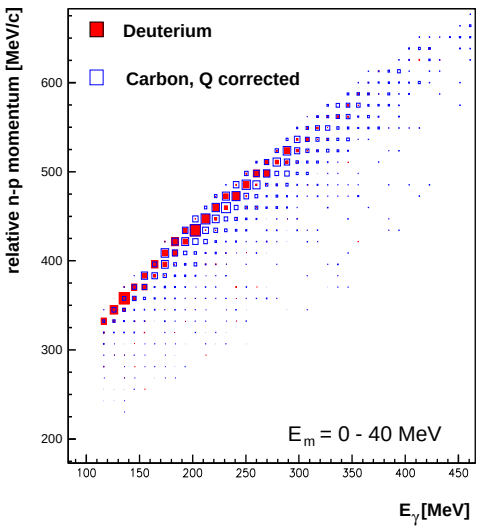
TOF

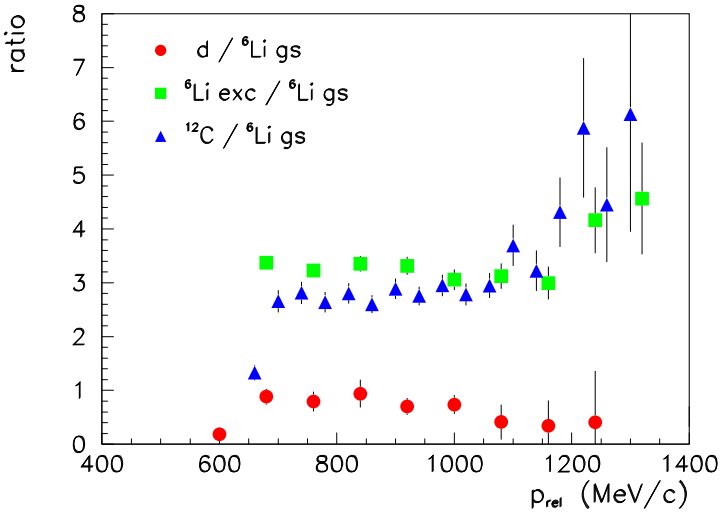
preliminary !!

^{12}C P_{rel} and ^{4}He P_{miss}



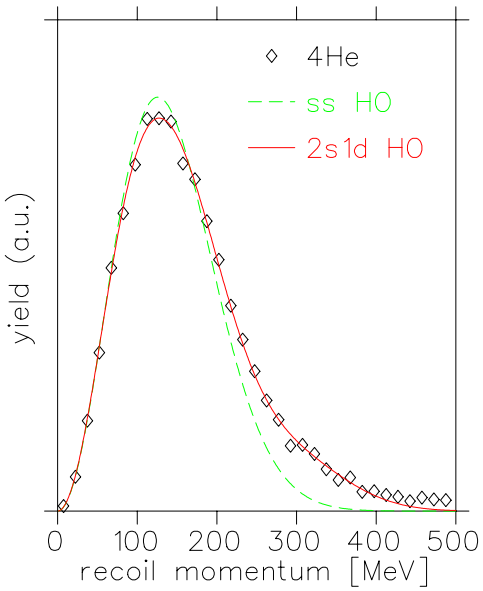
P_{rel} of ^{12}C and D

Eventwise analysis of p_{rel} correction:
Q value via measured E_{2m}



Ratios of P_{rel}

of ^{12}C, D, ^{6}Li



^{4}He missing momentum

$$\vec{p}_m = \vec{k}_\gamma - \vec{p}_p - \vec{p}_n$$

Cut on $E_m < 50$ MeV
→ SM pair mom. distr.
→ direct 2N absorption

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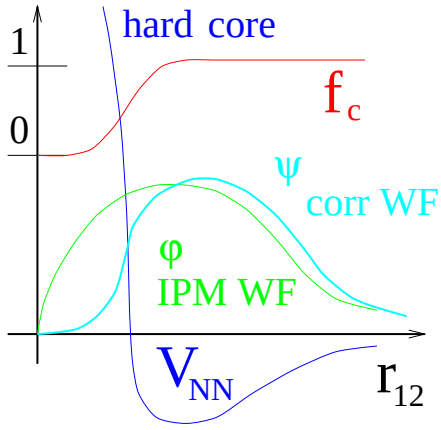
Use of Polarisation

Photon asymmetry $\Sigma = \frac{1}{P_\gamma}\frac{\sigma_{||}-\sigma_\perp}{\sigma_{||}+\sigma_\perp}$ $\qquad \sigma_{||,\perp} = \sigma_0(1 \pm P_\gamma\Sigma)$

Jastrow Correlation:
$\psi_{12} = \phi_1\phi_2 f_c(r_{12})$

Direct photo absorption:
$\sigma_0 = |\sum_{\text{1B,MEC,IC}} J(f)|^2$
$\sigma_0\Sigma = |\sum_{\text{interference}} J(\pm f)|^2$

Ryckebusch: Phys. Lett. B383 (96)
Boato, Giannini: J. Phys. G15 (89)
Add. evidence: Boffi: Nucl. Phys. A564 (93)



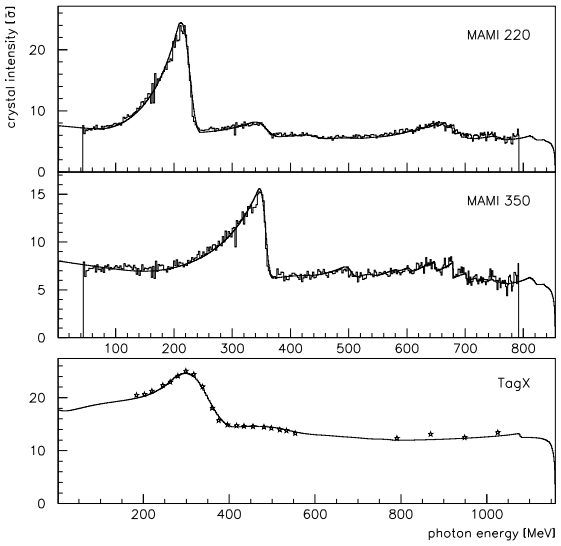
Linear polarised Bremsstrahlung
from coherent e^- scattering off a lattice

kinematical (pancake) and Bragg ($\vec{g} = \vec{q}$) constraints

incoherent Hubbell xsec

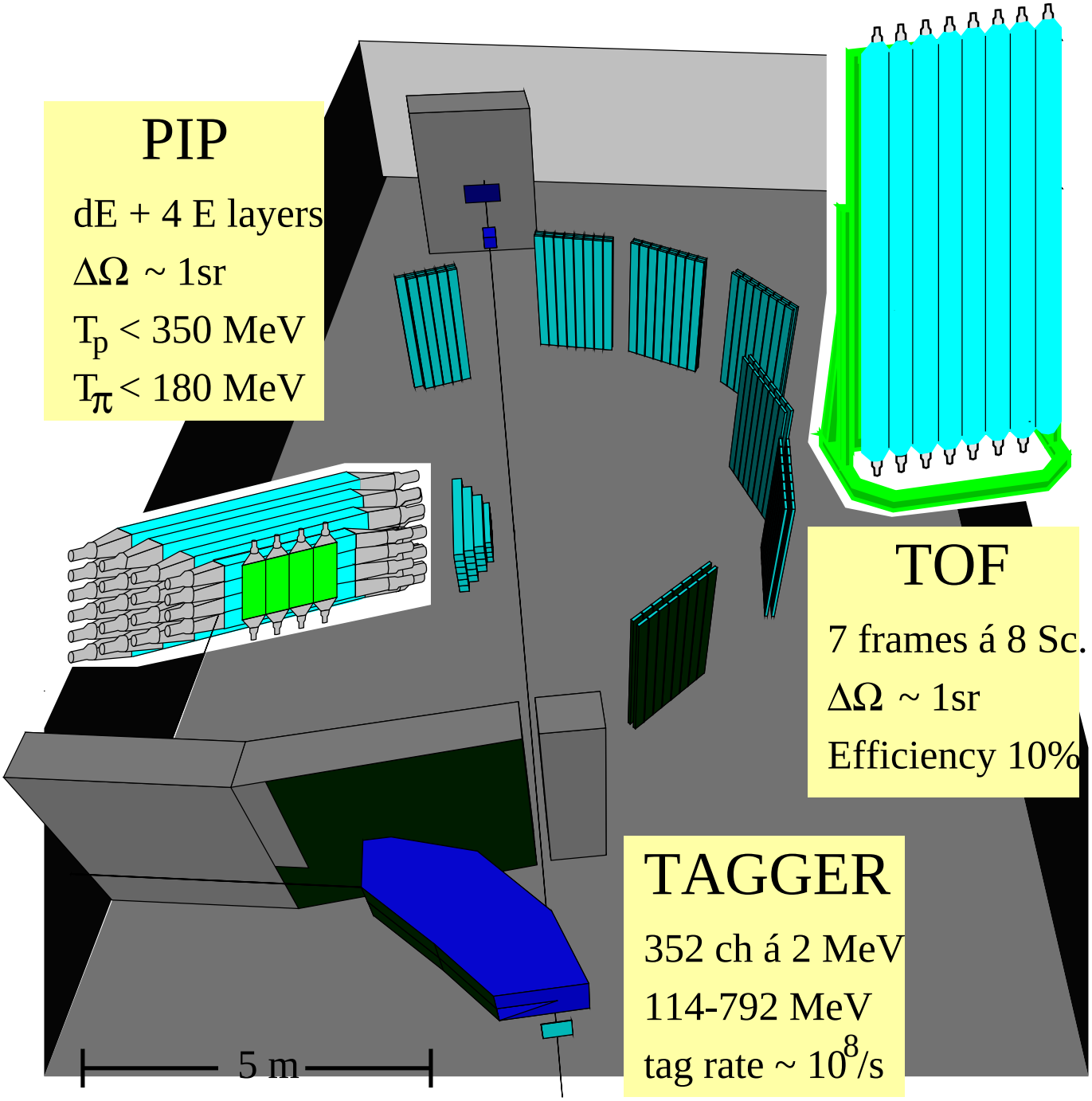
e^- Brems.: Owens et al. NIM 111(73)

Analytical and Monte Carlo treatment of e^- beam divergence and spot size, multiple scattering and collimation



PiP TOF

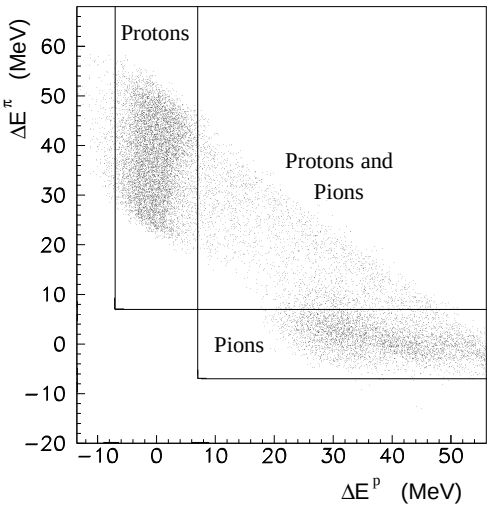
Experimental Setup



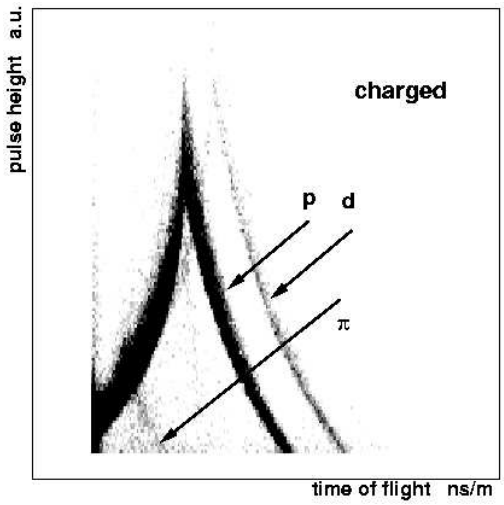
PiP and TOF

Particle separation:

range method

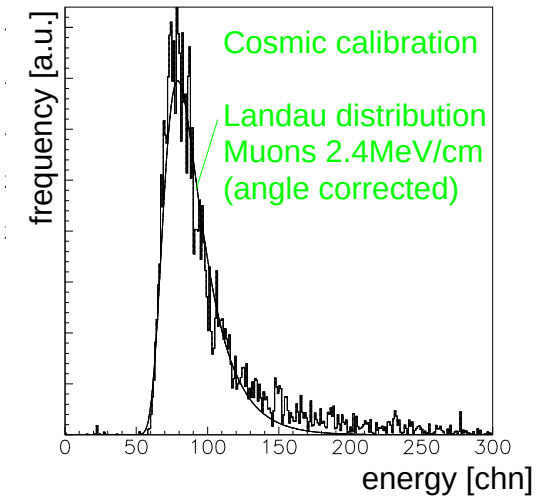


dE-E

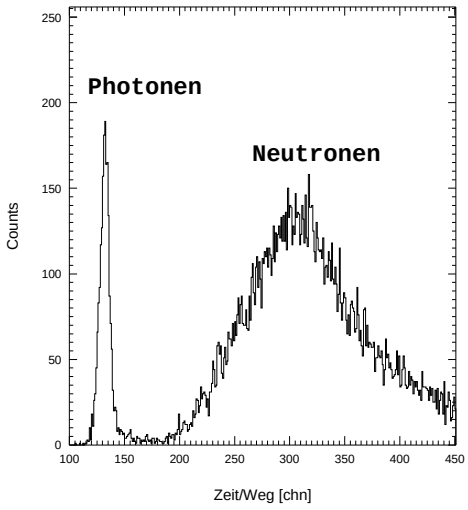


Energy calibration:

E_p from light output

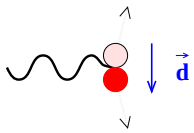


E_n from tof



PiP
TOF

^{4}He/^{12}C Photon Asymmetry in Comparison

Low E_γ : 

E1 dominant $\rightarrow \Sigma$ pos

$E_\gamma > \pi$ threshold :

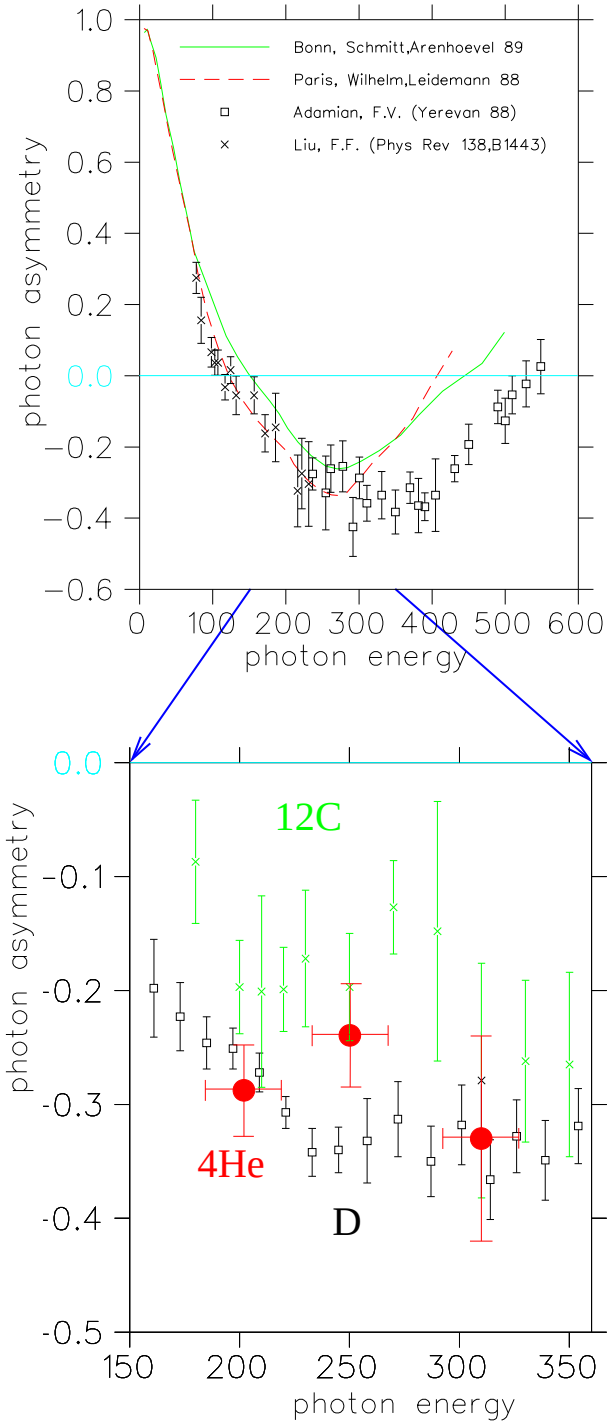
M1 dominant $\rightarrow \Sigma$ neg
(N-Δ transition $\sim$ M1)

$(\theta_p = 90°)$

^{4}He $\sim$ D ?
(only subset of data !
calibration not yet finished)

^{12}C : FSI or
medium SRC effects

$(50° < \theta_p < 130°)$



preliminary !!

Summary

- Previous experiments:
  - reaction mechanisms understood
  - direct 2N absorption separable
- Improved description of polarised Bremsstrahlung
  $\rightarrow$ reliable determination of degree of polarisation
- Photon asymmetry measurements on ^{4}He und ^{12}C
  successfull with encouraging preliminary results

Prospects

- Continue analysis on all E_γ for both (np,pp) channels
  $\rightarrow$ Asymmetry in dependence of E_γ and ϑ_N
- Better theoretical calculations necessary, in particular ^{4}He
  $\rightarrow$ enhanced cooperation with theorists
  from Gent, Trento, Pavia, Valencia, Tübingen
- High resolution ^{16}O Experiment (testrun completed)
  separate final states to allow the study of state dependence
  (aimed at E_m resolution of 1.5 MeV)