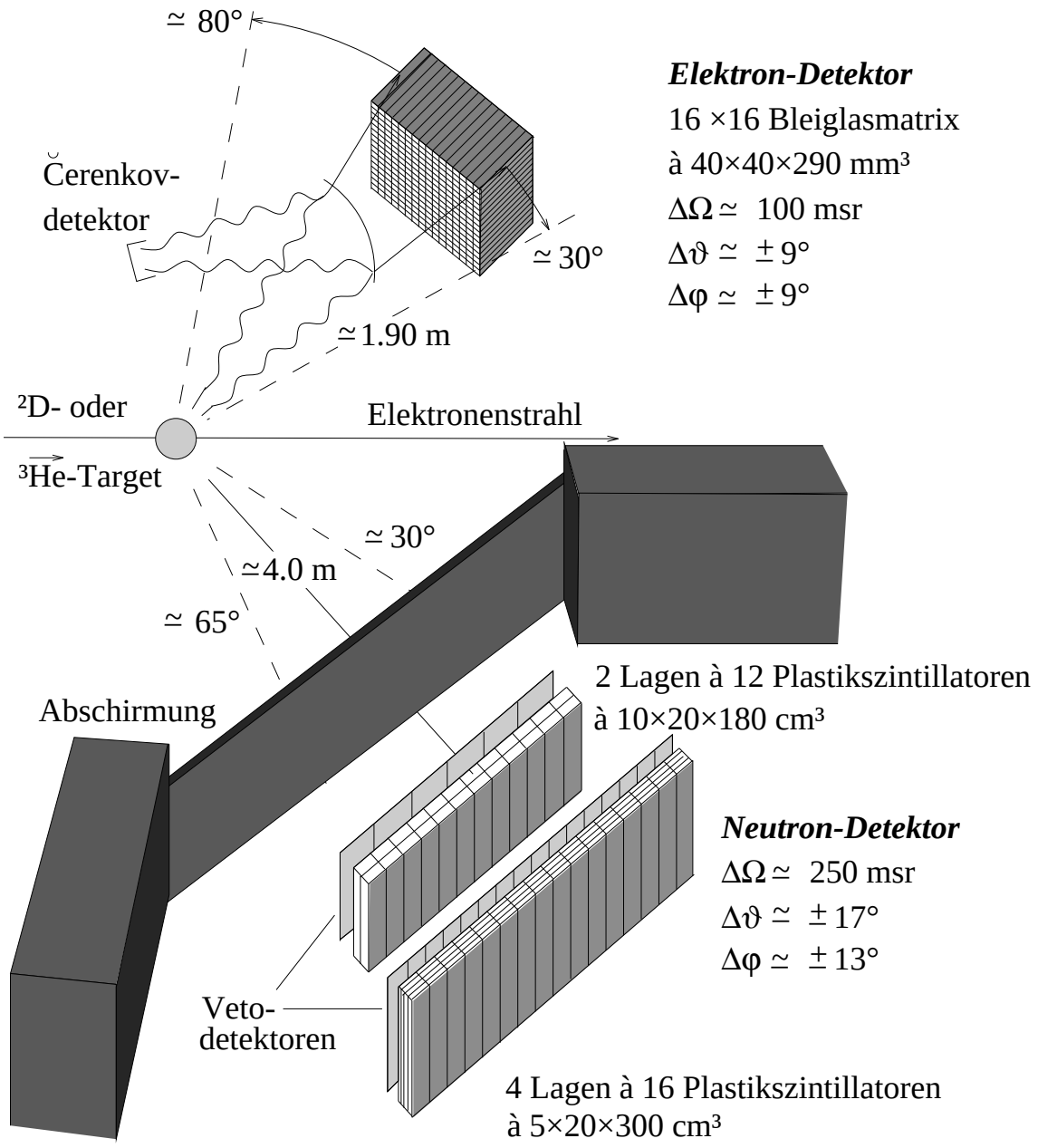


Elektron-Detektor

16 ×16 Bleiglasmatrix

à 40×40×290 mm³

$\Delta\Omega \simeq$ 100 msr

$\Delta\vartheta \simeq \pm 9°$

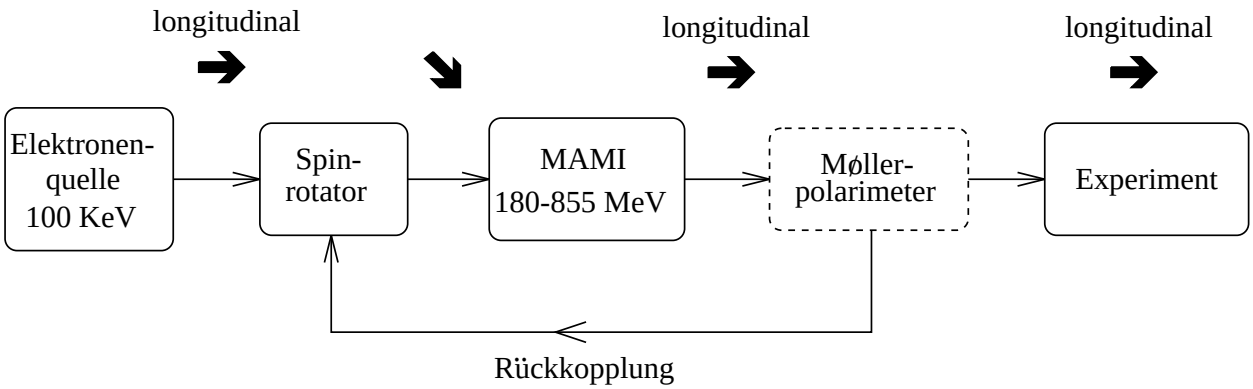
$\Delta\varphi \simeq \pm 9°$

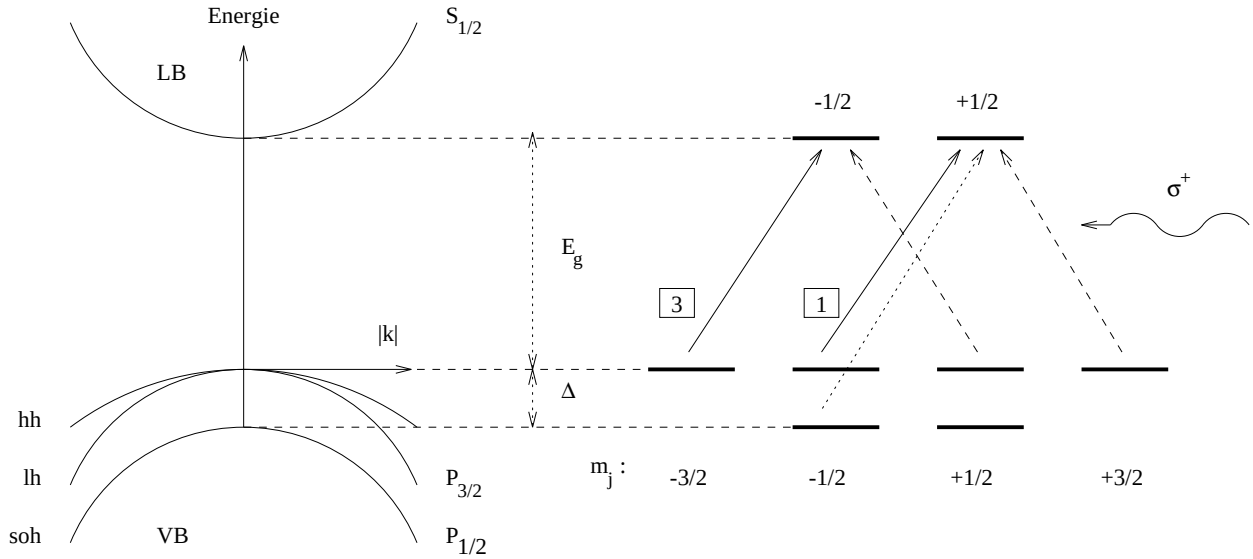
Neutron-Detektor

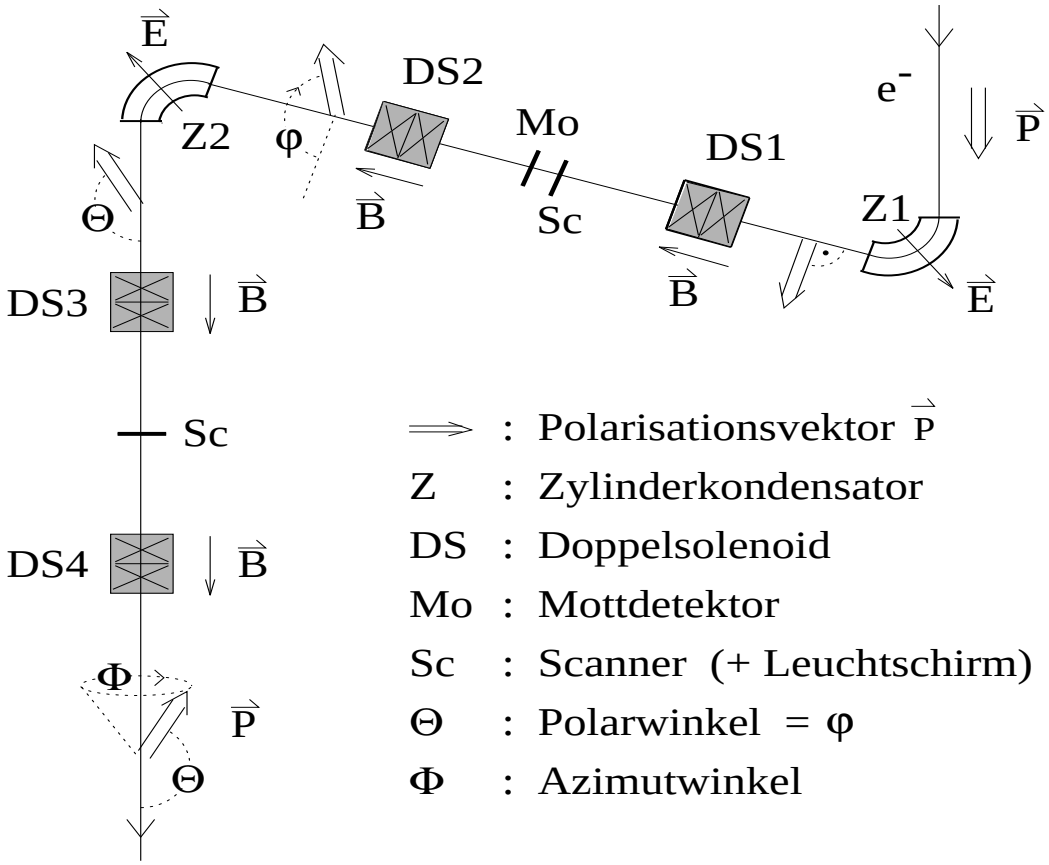
$\Delta\Omega \simeq$ 250 msr

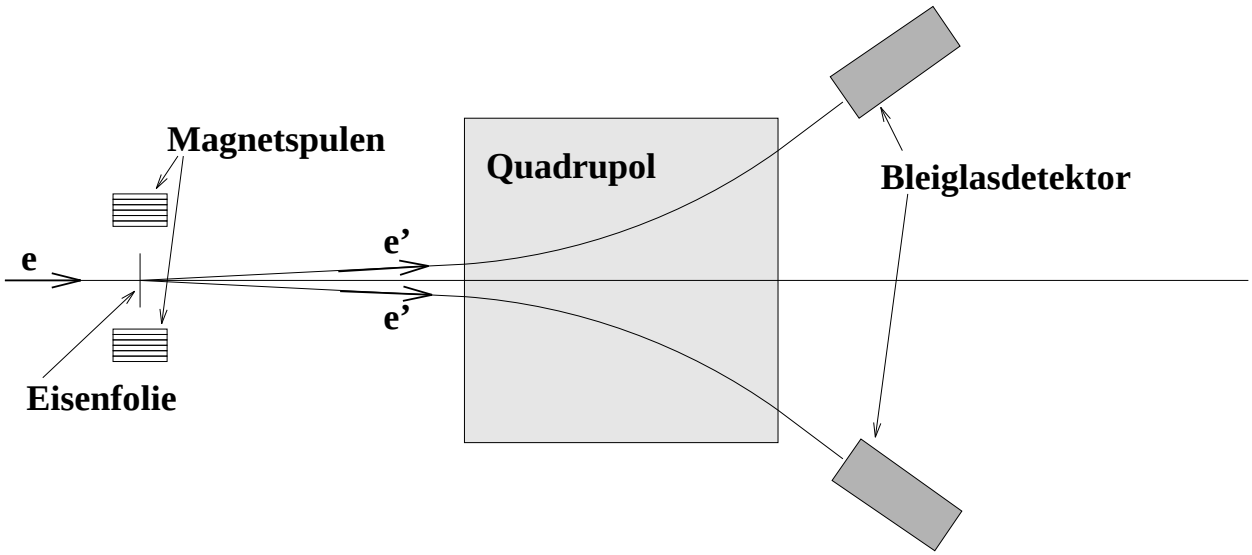
$\Delta\vartheta \simeq \pm 17°$

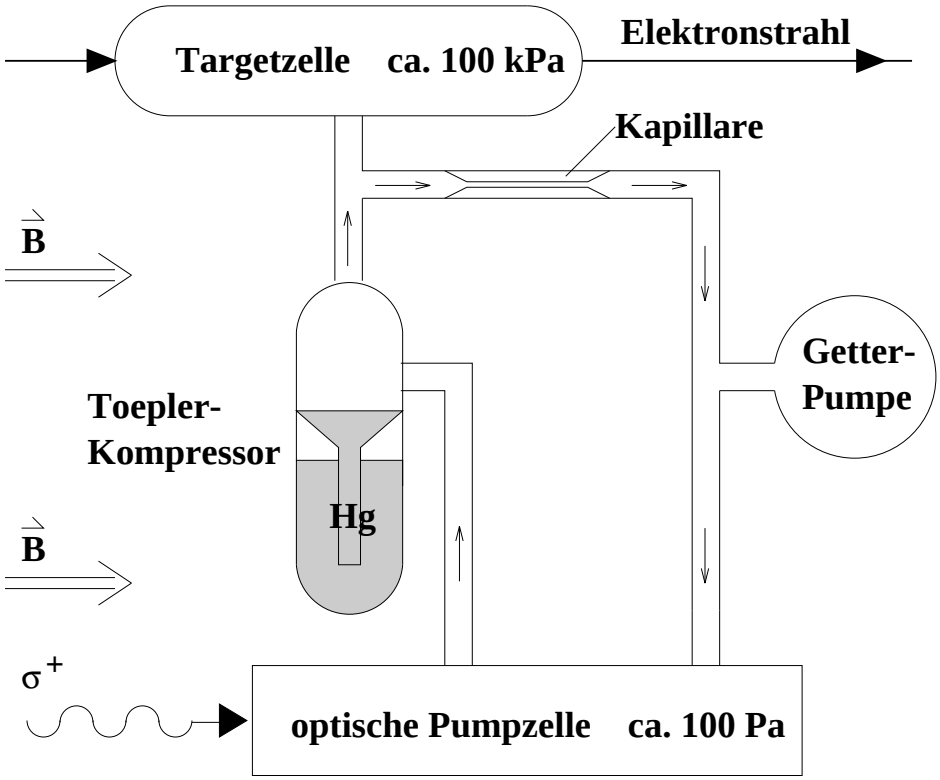
$\Delta\varphi \simeq \pm 13°$

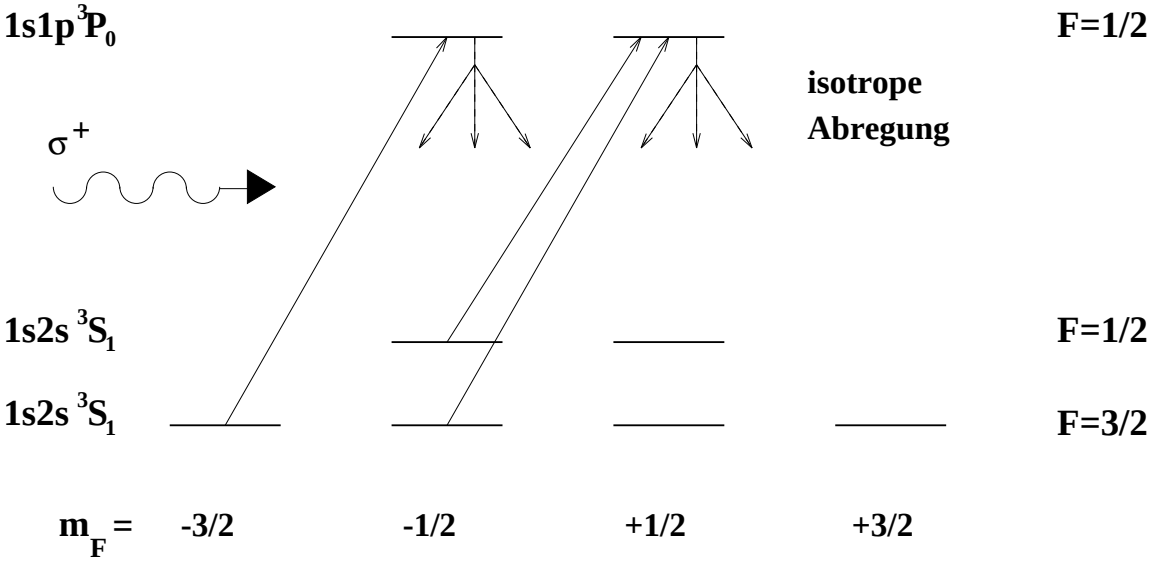

longitudinal
longitudinal
longitudinal
Elektronen-
quelle
100 KeV
Spin-
rotator
MAMI
180-855 MeV
Møller-
polarimeter
Experiment
Rückkopplung

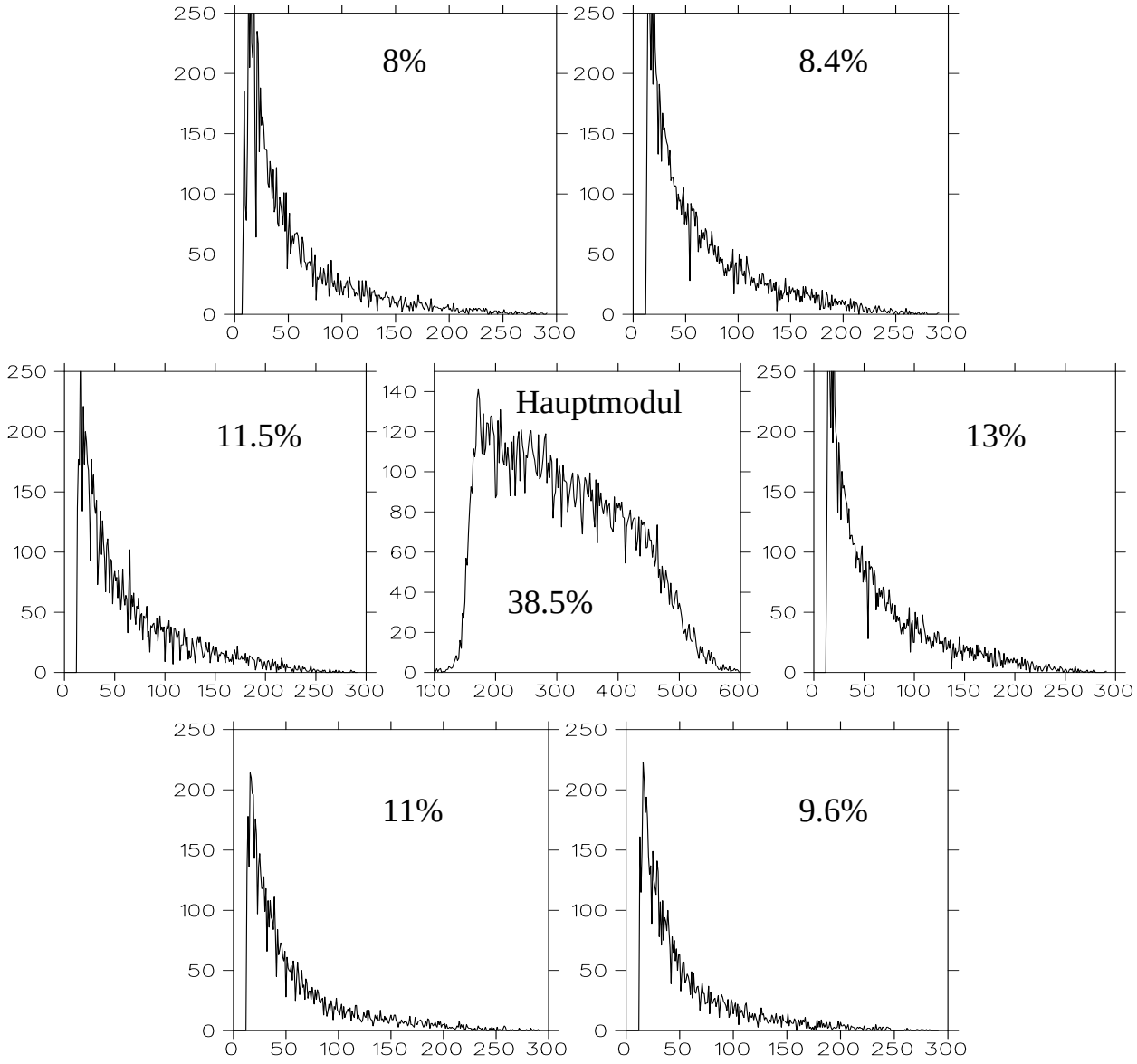

Energie
$S_{1/2}$
LB
-1/2
+1/2
σ^+
E_g
3
1
|k|
Δ
hh
lh
soh
VB
$P_{3/2}$
$P_{1/2}$
m_j :
-3/2
-1/2
+1/2
+3/2

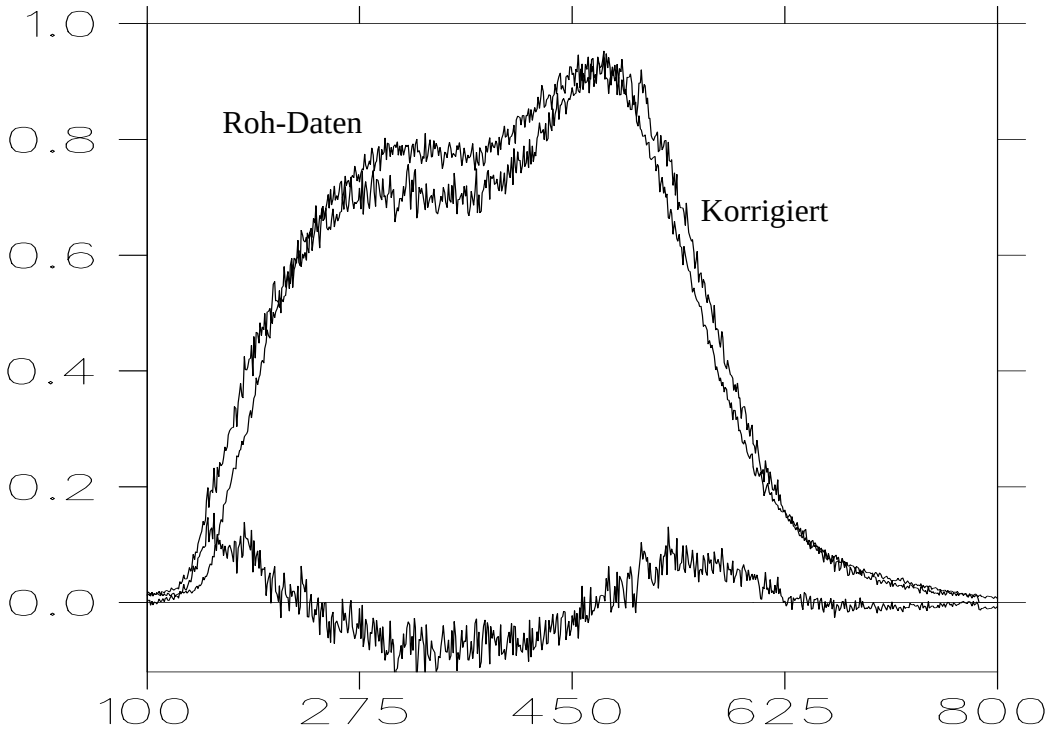

E
Z2
φ
DS2
Mo
Sc
DS1
e-
P
Z1
E
B
B
B
Θ
DS3
B
Sc
DS4
B
Φ
P
Θ
⟹ : Polarisationsvektor P
Z : Zylinderkondensator
DS : Doppelsolenoid
Mo : Mottdetektor
Sc : Scanner (+ Leuchtschirm)
Θ : Polarwinkel = φ
Φ : Azimutwinkel


Magnetspulen
Quadrupol
Bleiglasdetektor
e
e'
e'
Eisenfolie

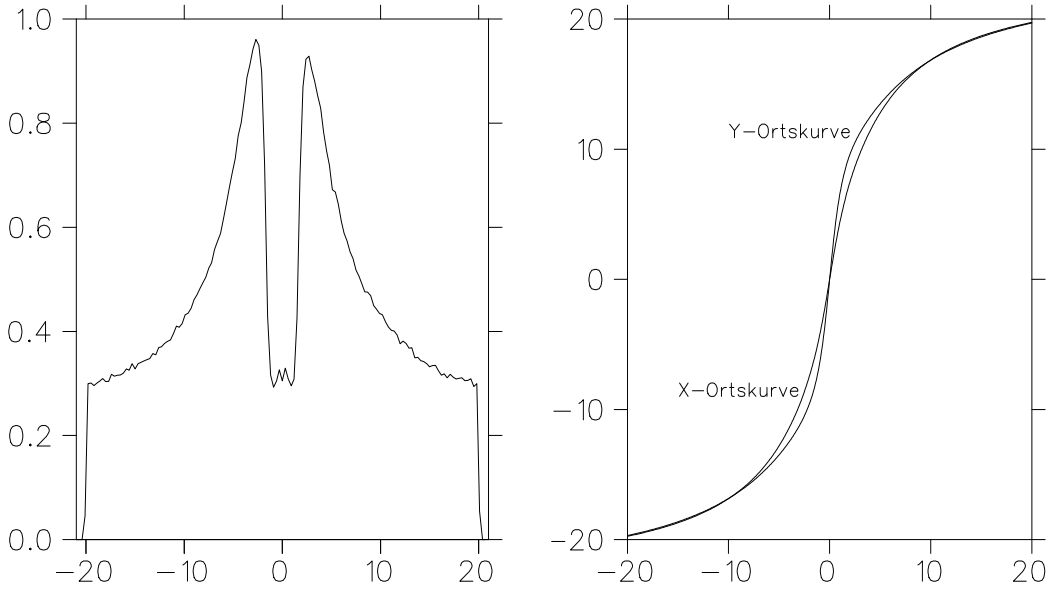

Targetzelle ca. 100 kPa
Elektronstrahl
Kapillare
B
Getter-
Pumpe
Toepler-
Kompressor
Hg
B
σ+
optische Pumpzelle ca. 100 Pa

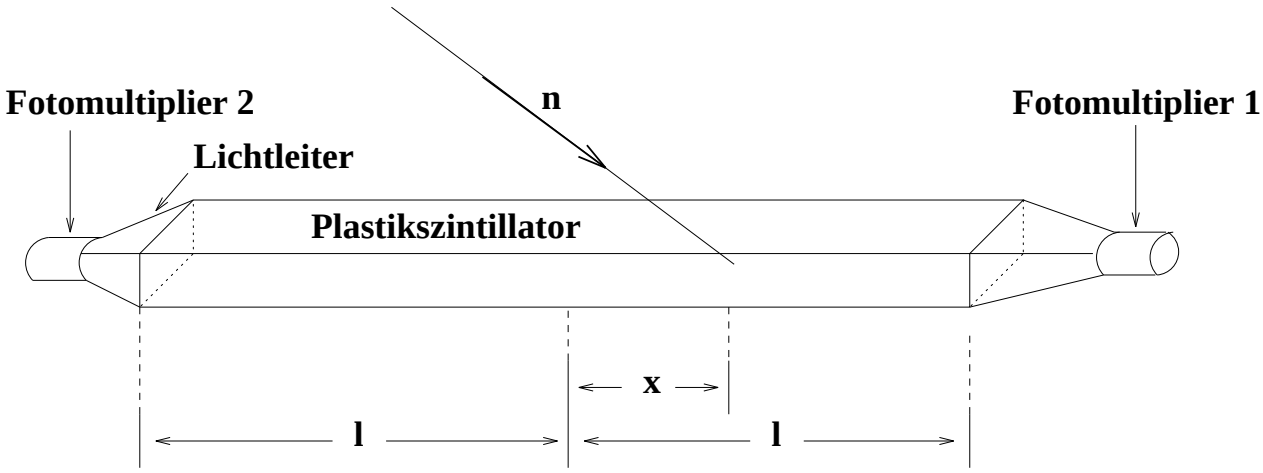

1s1p 3P0
F=1/2
isotrope
Abregung
σ+
1s2s 3S1
F=1/2
1s2s 3S1
F=3/2
mF = -3/2 -1/2 +1/2 +3/2

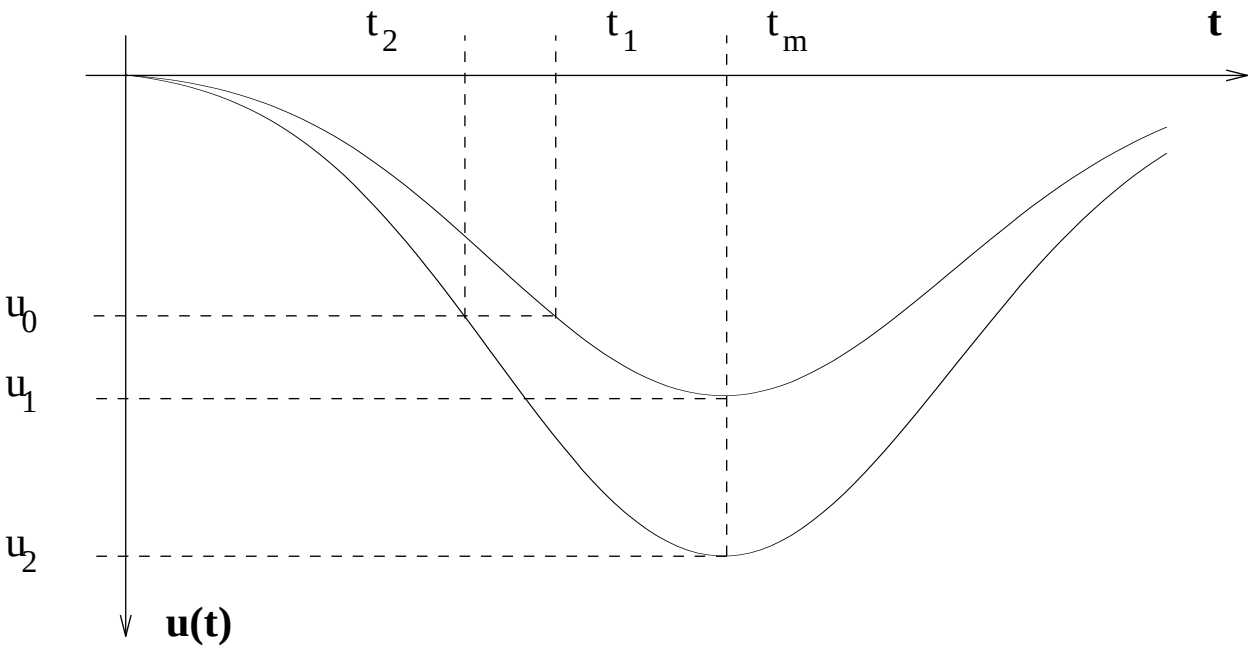

8%
8.4%
11.5%
Hauptmodul
38.5%
13%
11%
9.6%



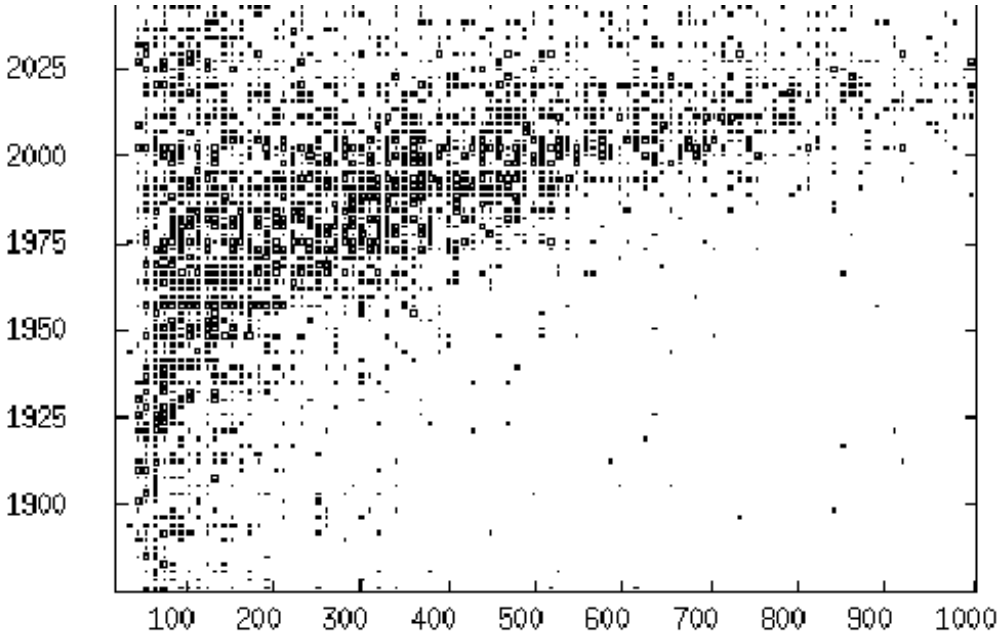
$$\vec{x}_e = \sum_{\leq 3R_M} \mathrm{QDC}_i^{\mathrm{korr}} \vec{x}_i \Big/ \sum_{\leq 3R_M} \mathrm{QDC}_i^{\mathrm{korr}}$$



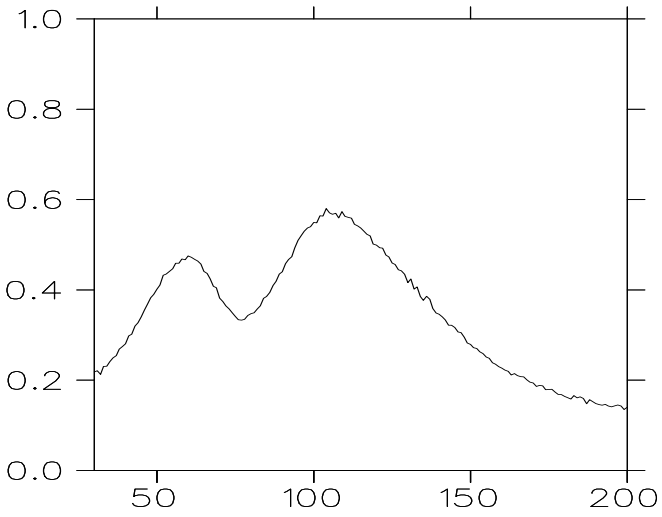

Fotomultiplier 2
n
Fotomultiplier 1
Lichtleiter
Plastikszintillator
x
l
l

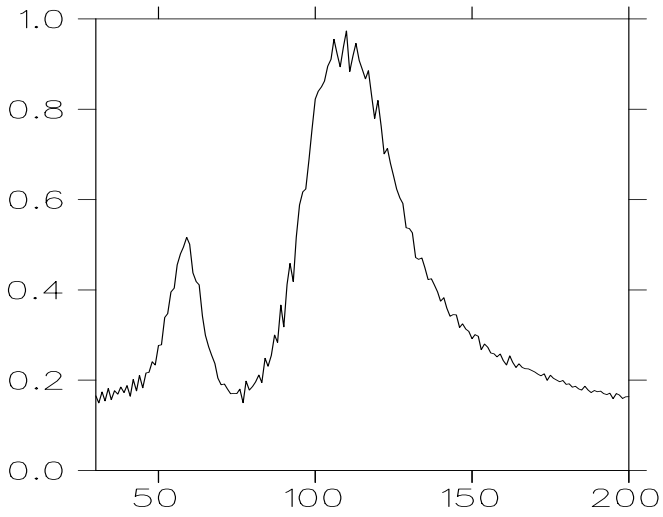

t2
t1
tm
t
u0
u1
u2
u(t)

TDC-Wert



QDC-Wert





Vierer-Impulserhaltungssatz (elastische Streuung)

$$\vec{e} \; + \; {}^3\overrightarrow{He} \quad \rightarrow \quad e' \; + \; n \; + pp$$

$$k^\mu + (M, \vec{0}) \;\; = \;\; k'^\mu + p'^\mu + d'^\mu$$

Kinematische Größen

- Neutronimpuls vor/nach dem Stoß: p_μ, p'_μ
- Elektronrichtung nach dem Stoß: $\hat{k}'$
- Elektronenergie nach dem Stoß: k'

Annahmen

- Spektator–Modell (verschwindender Impulstransfer zum 'Diproton') $\vec{d} = \vec{d}\,' = -\vec{p}$
- On shell Bedingung: $M = B + E(\vec{p}) + E_r(\vec{p})$.
- PWIA, keine FSI

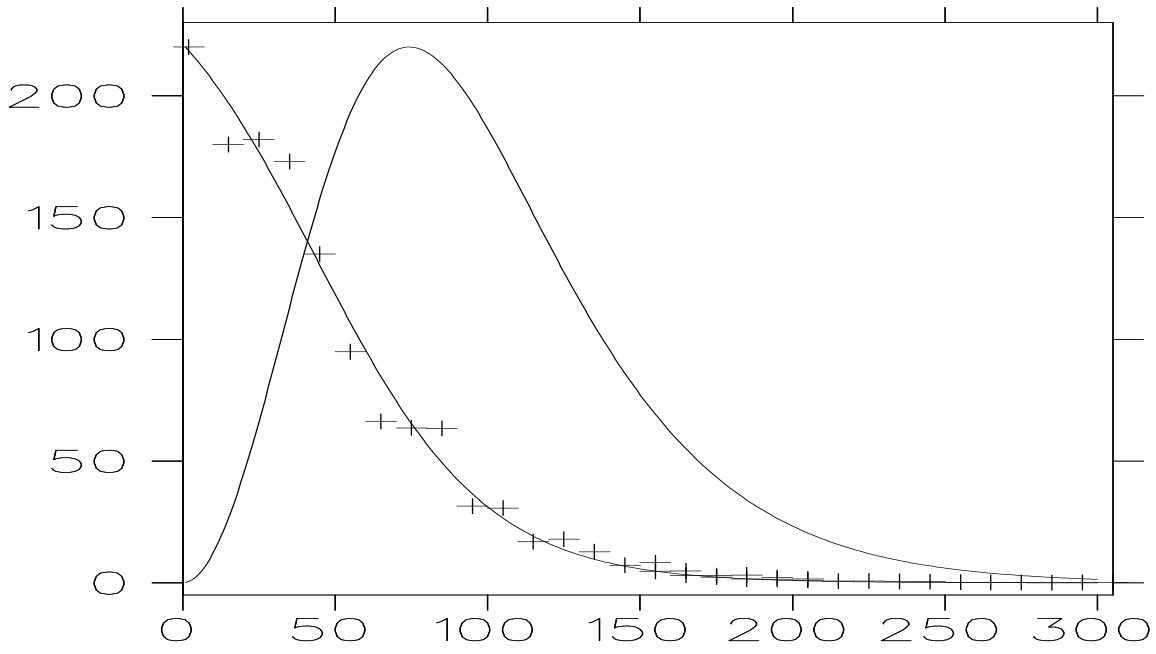
Energierekonstruktion

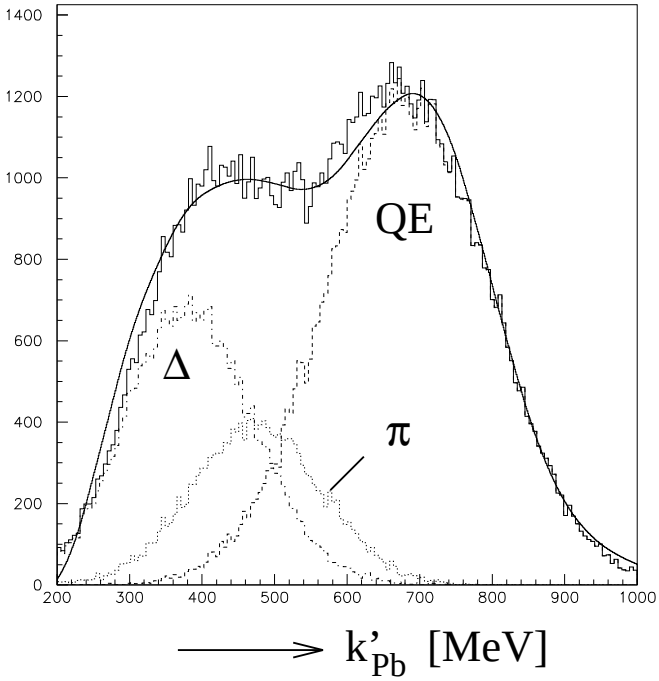
$$\text{Elektronenergie:} \;\; k'(\vec{p}\,') \;\; = \;\; \frac{kE' - \vec{k}\,\vec{p}\,'}{E' - k - \hat{k}'(\vec{p}\,' - \vec{k}\,)}$$

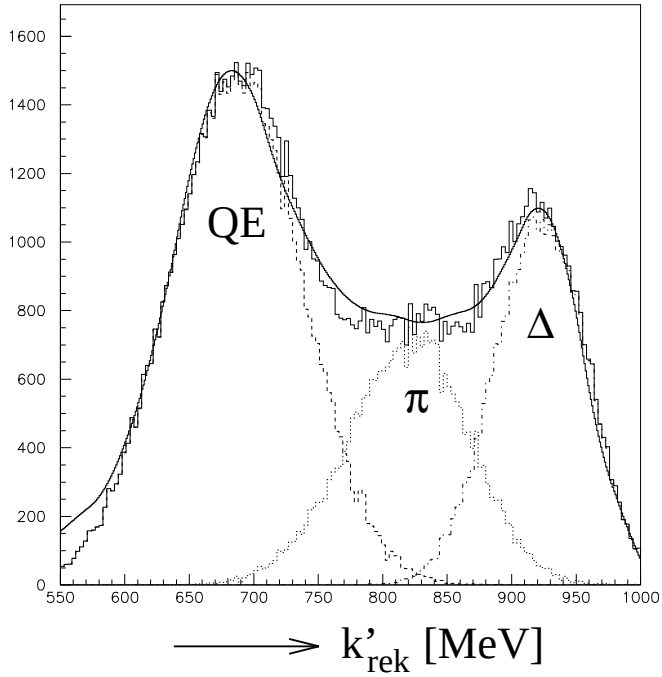
$$\text{Neutronimpuls:} \quad \vec{p} \quad = \; k'\hat{k}' + \vec{p}\,' - \vec{k}$$

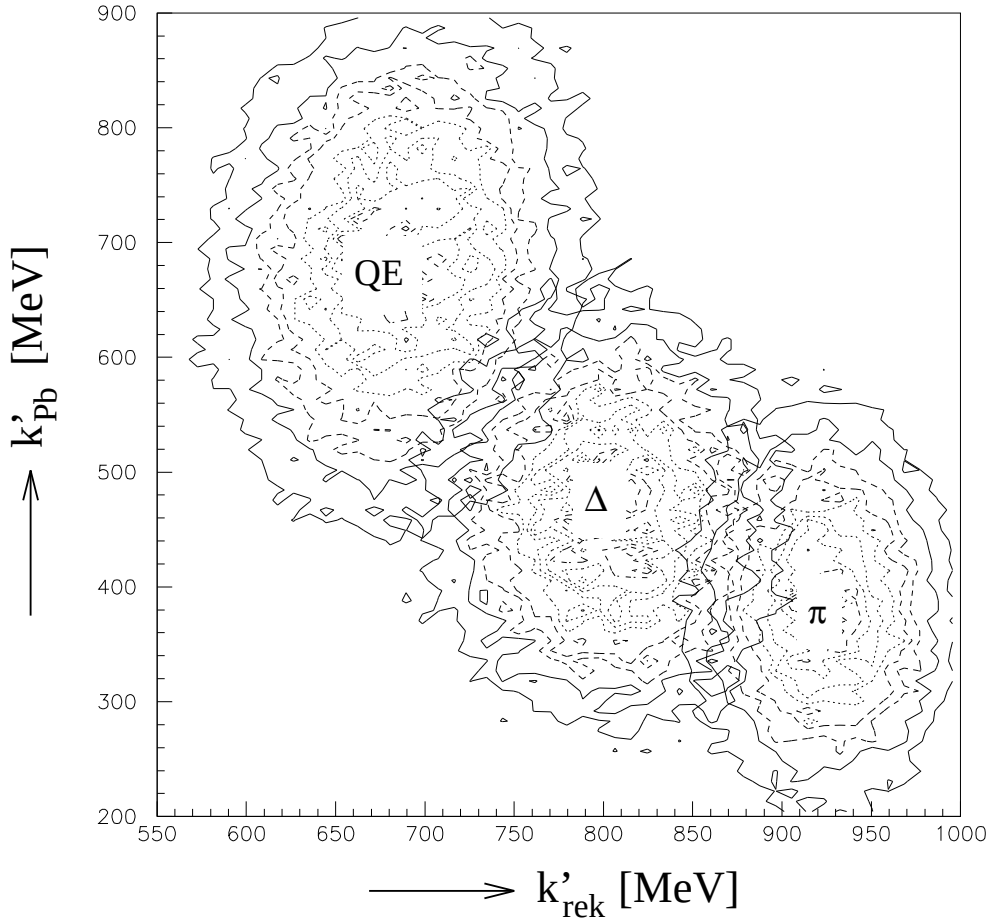
$$e\,p \longrightarrow e'\,\pi^+\,n$$
$$e\,n \longrightarrow e'\,\pi^0\,n$$

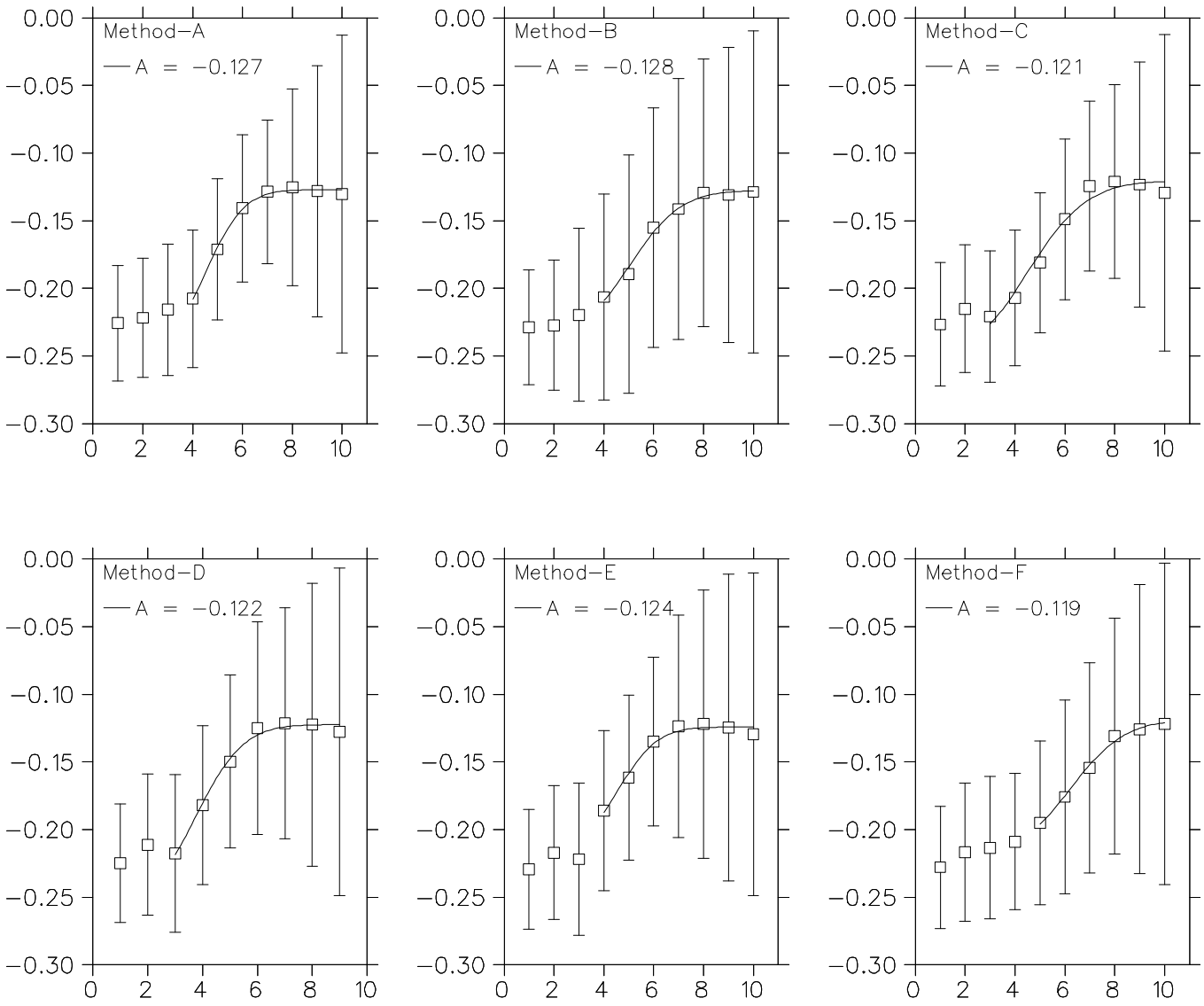
$$e\,p \longrightarrow e'\,\Delta^0$$
$$\hookrightarrow n\,\pi^0$$
$$e\,n \longrightarrow e'\,\Delta^+$$
$$\hookrightarrow n\,\pi^+$$




QE
Δ
π
k'Pb [MeV]


QE
Δ
π
k'rek [MeV]


QE
Δ
π
k'Pb [MeV]
k'rek [MeV]


Method–A
A = −0.127
Method–B
A = −0.128
Method–C
A = −0.121
Method–D
A = −0.122
Method–E
A = −0.124
Method–F
A = −0.119
0.00
−0.05
−0.10
−0.15
−0.20
−0.25
−0.30
0
2
4
6
8
10