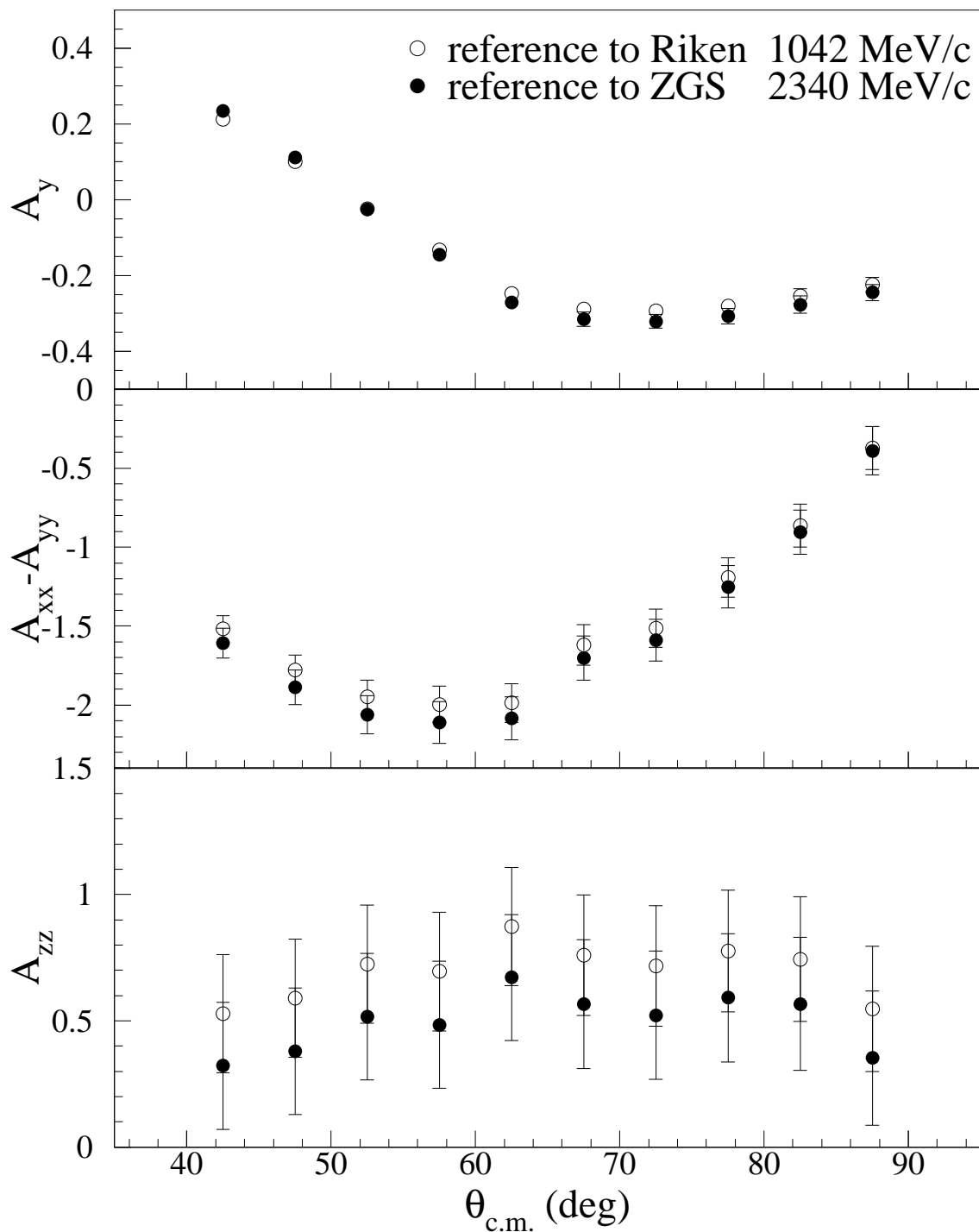


**Analyzing Powers @ 1850 MeV/c**

All fits use  $P_V$  and  $P_T$  for spinstate 0 are fixed to 0.0



## Polarization measured during night Dec. 8th/9th

using Analyzing powers with reference to Riken Data @ 1042 MeV/c:

state	P_V	P_T
=====		
000 0	0.000	0.000
001 1	-0.566 +- 0.032	0.020 +- 0.026
010 3	-0.325 +- 0.032	-0.619 +- 0.029
101 5	-0.701 +- 0.032	0.474 +- 0.022
110 6	0.696 +- 0.032	0.547 +- 0.022

using Analyzing powers with reference to ZGS Data @ 2340 MeV/c:

state	P_V	P_T
=====		
000 0	0.000	0.000 +- 0.002
001 1	-0.516 +- 0.029	0.020 +- 0.024
010 2	-0.287 +- 0.028	-0.565 +- 0.025
101 3	-0.657 +- 0.030	0.462 +- 0.022
110 4	0.653 +- 0.030	0.535 +- 0.022

## Application to Scaler Data

Lets denote the raw experimental counts for the left, right, top and bottom detectors by  $L_r$ ,  $R_r$ ,  $T_r$ , and  $B_r$  and the efficiency corrected counts by  $L$ ,  $R$ ,  $T$ ,  $B$ , with

$$R = R_r / \eta_R \quad (1)$$

and for  $T$  and  $B$  accordingly. There are three unknown *relative* efficiencies to be determined:  $\eta_{R,T,B}$  where  $\eta_L$  has been fixed to 1.

For the efficiency corrected counts the following relations hold

$$\epsilon_1 = \frac{L - R}{L + R} = \frac{3}{2} \frac{P_V A_y}{\left[1 - \frac{1}{4} P_T (A_{zz} + A_{xx} - A_{yy})\right]} \quad (2)$$

$$\epsilon_5 = 4 \frac{L + R - T - B}{L + R + T + B} = - \frac{P_T (A_{xx} - A_{yy})}{1 - \frac{1}{4} P_T A_{zz}} \quad (3)$$

So we can write

$$P_T = - \frac{4\epsilon_5}{4(A_{xx} - A_{yy}) - \epsilon_5 A_{zz}} \quad (4)$$

and

$$P_V = \frac{2\epsilon_1}{3A_y} \left( 1 + \frac{(A_{zz} + A_{xx} - A_{yy})\epsilon_5}{4(A_{xx} - A_{yy}) - \epsilon_5 A_{zz}} \right) \quad (5)$$

Taking the polarization obtained from the pd elastic scattering data we can determine  $\eta_{R,T,B}$  and  $A_y$ ,  $A_{xx} - A_{yy}$ , and  $A_{zz}$ , by a nonlinear  $\chi^2$ -fit. The analyzing powers are now the effective values for the events counted by the scalers. In the fit we fix  $(T - B)/(T + B) = 0$  to determine  $\eta_T$  and  $\eta_B$  separately.

The result is

fit par.	fit using calibration based on		average
	1042 MeV/c	2340 MeV/c data	
eta_R	0.9619 +- 0.0005	0.9619 +- 0.0006	0.9619 +- 0.0006
eta_T	1.0494 +- 0.0006	1.0494 +- 0.0006	1.0494 +- 0.0006
eta_B	1.0550 +- 0.0006	1.0550 +- 0.0006	1.0550 +- 0.0006
Ay	0.0946 +- 0.0028	0.1038 +- 0.0032	0.0992 +- 0.0033
Axx-Ayy	-0.0895 +- 0.0024	-0.0947 +- 0.0026	-0.0921 +- 0.0026
Azz	0.34 +- 0.17	0.11 +- 0.18	0.23 +- 0.18

we use the average to determine the polarization.

There is a small script

```
getPolarization runnumber
```

to be used to extract the polarization for that run. There is a statistical error (based on the statistical errors of the scaler count rates) and an systematic error (based on the errors mainly of  $A_y$ ,  $A_{xx} - A_{yy}$ , and  $A_{zz}$ )

Example:

```
prompt> getPolarizationNew 150 | tail -7
i          P_V          P_T
  value  stat  syst  value  stat  syst
0  0.002 +- 0.003 +- 0.000  0.014 +- 0.010 +- 0.000
1 -0.530 +- 0.003 +- 0.018 -0.048 +- 0.010 +- 0.001
3 -0.290 +- 0.003 +- 0.012 -0.599 +- 0.011 +- 0.024
5 -0.660 +- 0.004 +- 0.025  0.415 +- 0.011 +- 0.014
6  0.692 +- 0.004 +- 0.029  0.569 +- 0.012 +- 0.021
```

For comparison the values of version 2 (February 5th)

```
i          P_V          P_T
  value  stat  syst  value  stat  syst
0  0.002 +- 0.003 +- 0.000  0.013 +- 0.010 +- 0.000
1 -0.521 +- 0.003 +- 0.017 -0.048 +- 0.010 +- 0.001
3 -0.279 +- 0.003 +- 0.012 -0.568 +- 0.010 +- 0.020
5 -0.662 +- 0.004 +- 0.025  0.422 +- 0.012 +- 0.013
6  0.699 +- 0.004 +- 0.029  0.586 +- 0.013 +- 0.021
```