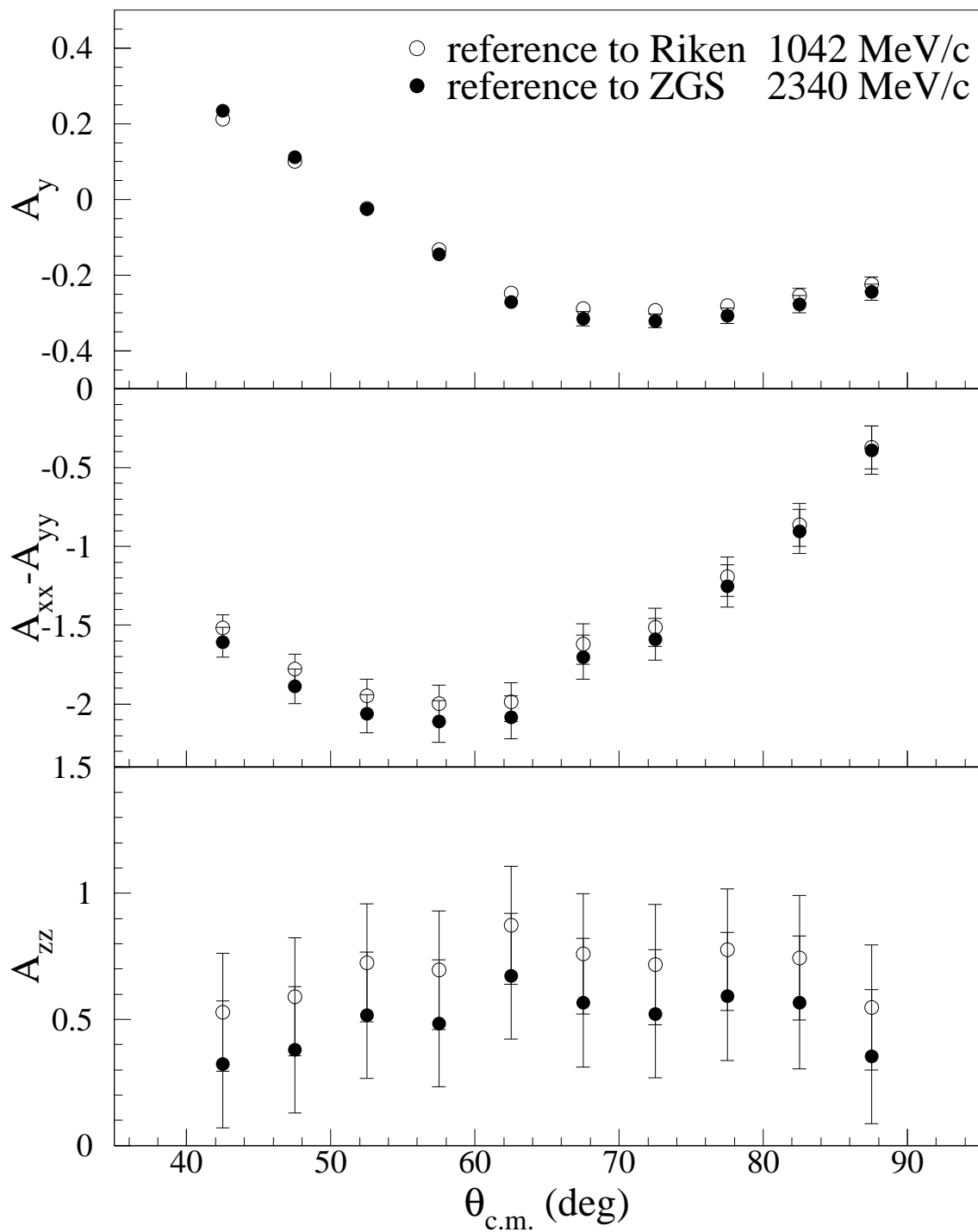


Analyzing Powers @ 1850 MeV/cAll fits use P_V and P_T for spinstate 0 are fixed to 0.0

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 η_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

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

and

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

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 χ^2 -fit. The analyzing powers are now the effective values for the events counted by the scalers.

The result is

| fit par. | fit using calibration based on | | |
|-------------|--------------------------------|-------------------|-------------------|
| | 1042 MeV/c | 2340 MeV/c data | average |
| eta_R | 0.9618 +- 0.0006 | 0.9618 +- 0.0006 | 0.9618 +- 0.0006 |
| eta_T | 1.0494 +- 0.0006 | 1.0494 +- 0.0006 | 1.0494 +- 0.0006 |
| eta_B | 1.0549 +- 0.0006 | 1.0549 +- 0.0006 | 1.0549 +- 0.0006 |
| Ay | 0.0974 +- 0.0030 | 0.1037 +- 0.0032 | 0.1006 +- 0.0033 |
| Axx-Ayy | -0.0909 +- 0.0025 | -0.0954 +- 0.0026 | -0.0932 +- 0.0022 |
| Azz | 0.01 +- 0.18 | 0.11 +- 0.18 | 0.06 +- 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> getPolarization 150 | tail -7
```

| 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 |

For comparison the old values (with some errors in the formulas for the polarization)

| 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 | -0.533 | + - 0.004 | + - 0.001 | -0.048 | + - 0.010 | + - 0.002 |
| 3 | -0.294 | + - 0.003 | + - 0.007 | -0.597 | + - 0.010 | + - 0.025 |
| 5 | -0.659 | + - 0.004 | + - 0.012 | 0.416 | + - 0.011 | + - 0.015 |
| 6 | 0.690 | + - 0.004 | + - 0.017 | 0.572 | + - 0.012 | + - 0.023 |