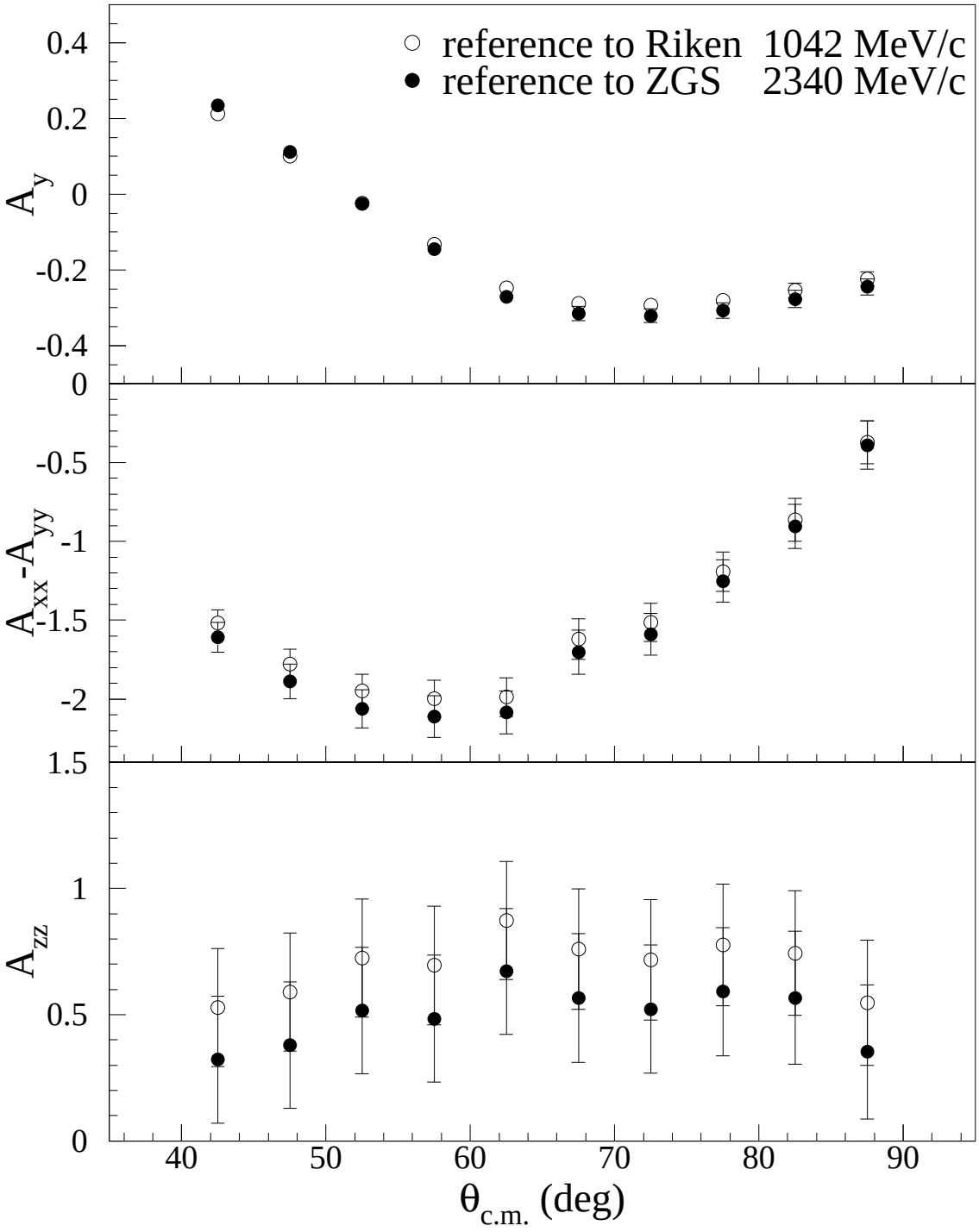
Analyzing Powers @ 1850 MeV/c

All fits use P_z and P_{zz} 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	Pz	Pzz
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	Pz	Pzz
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

We use the following relations

$$\epsilon_1 = \frac{L-R}{L+R} = \frac{3}{2}\frac{p_z A_y}{1-\frac{1}{4}P_{zz}A_{zz}} \tag{1}$$

$$\epsilon_5 = 4\frac{L+R-T-B}{L+R+T+B} = \frac{p_{zz}A_{xx-yy}}{1-\frac{1}{4}P_{zz}A_{zz}} \tag{2}$$

with efficiency corrected scaler counts L, R, T, and B for left, right, top and bottom. There are three unknown relative efficiencies to be determined: $\varepsilon_{R,T,B}$ where ε_L has been fixed to 1.

So we can write

$$p_{zz} = \frac{4\epsilon_5}{A_{xx-yy}+\epsilon_5 A_{zz}} \tag{3}$$

and

$$p_z = \frac{2\epsilon_1}{A_y}\left(1-\frac{A_{zz}\epsilon_5}{A_{xx-yy}+\epsilon_5 A_{zz}}\right) \tag{4}$$

Taking the polarization obtained from the pd elastic scattering data we can determine $\varepsilon_{R,T,B}$ and A_y, A_{xx-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          fit using calibration based on
par.      1042 Mev/c        2340 Mev/c data     average
=============================================================
eps_R     1.0396 +- 0.0006   1.0396 +- 0.0006  1.0396 +- 0.0006
eps_T     0.9510 +- 0.0022   0.9506 +- 0.0023  0.9508 +- 0.0023
eps_B     0.9497 +- 0.0022   0.9502 +- 0.0023  0.9500 +- 0.0023
Ay        0.0940 +- 0.0028   0.1032 +- 0.0031  0.0986 +- 0.0046
Axx-Ayy   0.0895 +- 0.0024   0.0947 +- 0.0025  0.0921 +- 0.0030
Azz       0.31   +- 0.17     0.08   +- 0.17    0.20   +- 0.17
```

we use the average to determine the polariztation.

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-yy}, and A_{zz})

Example:

```
prompt> getPolarization 150 | tail -7
i            Pz                          Pzz
   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
```