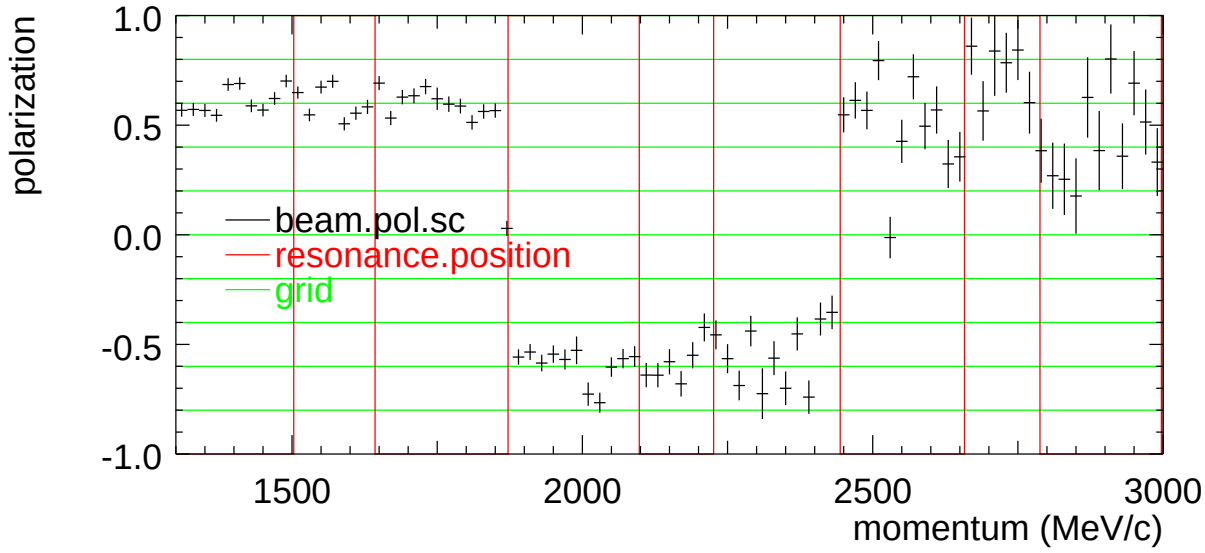
Proton Polarimetry

Statistics for 160 COSY-cycles with a 5μm thick C-Target (One bin contains data of 17.4 ms).

At 1900 MeV/c: $p = 0.527 \pm 0.063$



Assuming we accumulate data for 2s per cycle at one momentum, we would have a factor of 115 better statistics.

$\Longrightarrow$ we probably could go with less cycles per measurement than proposed in the run plan.

Deuteron Tensor Polarization

In the modell I use one obtains the tensor polarizations from vector polarizations as measured by the low energy polarimeter (NEPOL/LEP). This is done by assuming that the vector polarizations can be explained by four parameters:

- the three efficiencies $E_{1,2,3}$ of the RF-transitions 1, 2, 3 and 3.
- and the fraction α of polarized deuterons in the beam, taking into account some contribution of unpolarized deuterons.

Within this model the vector and tensor polarizations are given by

state	$p_{Z,\mathrm{th}}$	$p_{ZZ,\mathrm{th}}$	$p_{Z,\mathrm{model}}$	$p_{ZZ,\mathrm{model}}$
001	$-\frac{2}{3}$	0	$-\alpha\frac{2}{3}E_3$	0
010	$+\frac{1}{3}$	$+1$	$\alpha\frac{1}{3}E_2$	αE_2
011	$-\frac{1}{3}$	-1	$\alpha\frac{E_2-2E_3}{3}$	$\alpha E_2(1-2E_3)$
100	$+\frac{1}{2}$	$-\frac{1}{2}$	$\beta\frac{E_1}{3-E_1}$	$-\beta\frac{E_1}{3-E_1}$
101	-1	$+1$	$\beta\frac{E_1-2E_3-E_1E_3}{3-E_1}$	$\beta\frac{E_1(3E_1-1)}{3-E_1}$
110	$+1$	$+1$	$\beta\frac{E_1+E_2}{3-E_1}$	$\beta\frac{3E_2-E_1}{3-E_1}$
111	$-\frac{1}{2}$	$-\frac{1}{2}$	$\beta\frac{E_1-2E_3+E_2-E_1E_3}{3-E_1}$	$\beta\frac{3E_3(E_1-2E_2)-E_1+3E_2}{3-E_1}$

Where $\beta = \frac{\alpha(1-E1/3)}{\alpha(1-E1/3)+1-\alpha}$ is the unpolarized fraction of the deuteron beams with polarization states 1XX.

The parameters α and $E_{1,2,3}$ of this model can now be determined from the measured vector polarizations at the low energy polarimeter (LEP/NEPOL), a decent description is obtained with the following values:

$$\begin{array}{rclcrclcrcl} \alpha & = & 0.850 & ; & \beta & = & 0.791 & & & & \\ E_1 & = & 0.999 & ; & E_2 & = & 0.494 & ; & E_3 & = & 0.882 \end{array}$$

which yield the result

	LEP	model		fit	
state	p_Z	p_Z	p_{ZZ}	p_Z	p_{ZZ}
000	$+0.00$	0.000	0.000	$\mathbf{0.000}$	$\mathbf{0.000}$
001	-0.46	-0.500	0.000	-0.44 ± 0.03	0.29 ± 0.04
010	$+0.15$	0.140	0.420	$+0.09 \pm 0.04$	0.64 ± 0.04
011	-0.35	-0.360	-0.321		
100	$+0.35$	0.395	-0.395		
101	-0.70	-0.651	0.788	$\mathbf{-0.651}$	$\mathbf{0.788}$
110	$+0.57$	0.590	0.191	$+0.48 \pm 0.05$	0.31 ± 0.04
111	-0.52	-0.456	0.202		

These results are compared to those of the χ^2-fit to the dp-elastic scattering data.

Problem: Within the model there is no way to generate different values of p_{ZZ} for the states 000 and 001, as it is supported by the experimental data!