Lambda Polarization Data Binning

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• I have studied the 4.0 GeV data acquired in March 1998 to extract the expected statistics that we can expect for the next e1 running period in March 1999. The assumptions made are as follows:

- 30 days at 4.0 GeV $\times$ Beam/CLAS eff. factor of 40% = 288 hours of 'good' beam.
- DAQ speed improvement factor of 2.0.
- Second level trigger improvement factor of 2.0

Thus the rates extracted from the March 1998 e1 4.0 GeV running period have been multiplied by a factor of 1152 hours to give the statistics in each bin for the March 1999 running period. I have talked to a number of folks (including Bernhard) who think that my improvement factors for DAQ speed and the second level trigger are quite sensible. Also the Beam/CLAS efficiency factor employed is in good agreement with the factor extracted by Reinhard for the July g1 run of 42%. Now the big thing to consider is that the total number of Lambdas whose spin can be measured (i.e. detected with a final state of e$'$, K^+, p) is expected to total about 68000, over *all* photon energies.
The decision has to be made for the proposal how to bin the data for the Lambda polarization measurement in Q^2, W, $d\Omega_{K^+}$, and $d\Omega_p$. I put forth six scenarios below. The top part of each figure includes, for a given Q^2 and W bin, the total statistics expected. The bottom part of each figure includes the statistical error on the each polarization measurement within a given Q^2 and W bin (i.e. it includes the additional binning on the kaon solid angle). All statistical errors are calculated assuming the measured polarization is zero (the worst case error) and a beam polarization of 80%.

Scenario #1: Q^2 bin = $\pm$ 0.25 GeV^2, W bin = $\pm$ 0.1 GeV
$\cos\Theta_K$ bins = 4, ϕ_K bins = 4
$\cos\Theta_p$ bins = 1, ϕ_p bins = 1

	Counting Statistics			
$Q^2 \downarrow$/ W $\rightarrow$	1.7	1.9	2.1	2.3
2.5	2650	2765	-	-
2.0	4205	5357	2074	-
1.5	10080	10368	5760	-
1.0	4954	5472	3686	2074
	Statistical Error			
2.5	±0.30	±0.30	-	-
2.0	±0.24	±0.21	±0.34	-
1.5	±0.16	±0.15	±0.21	-
1.0	±0.22	±0.21	±0.26	0.34

Scenario #2: Q^2 bin = $\pm$ 0.25 GeV^2, W bin = $\pm$ 0.2 GeV
$\cos\Theta_K$ bins = 4, ϕ_K bins = 4
$\cos\Theta_p$ bins = 1, ϕ_p bins = 1

	Counting Statistics	
$Q^2 \downarrow$/ W $\rightarrow$	1.8	2.2
2.5	5415	-
2.0	9562	2074
1.5	20448	5760
1.0	10426	5760
	Statistical Error	
2.5	$\pm$0.21	-
2.0	$\pm$0.16	$\pm$0.34
1.5	$\pm$0.11	$\pm$0.21
1.0	$\pm$0.15	$\pm$0.21

Scenario #3: Q^2 bin = $\pm$ 0.5 GeV^2, W bin = $\pm$ 0.2 GeV
$\cos\Theta_K$ bins = 4, ϕ_K bins = 4
$\cos\Theta_p$ bins = 1, ϕ_p bins = 1

	Counting Statistics	
$Q^2 \downarrow$ / W $\rightarrow$	1.8	2.2
2.25	14977	2074
1.25	30874	11520
	Statistical Error	
2.25	$\pm$0.13	$\pm$0.34
1.25	$\pm$0.09	$\pm$0.15

Scenario #4: Q^2 bin = $\pm$ 0.25 GeV^2, W bin = $\pm$ 0.1 GeV
$\cos\Theta_K$ bins = 4, ϕ_K bins = 1
$\cos\Theta_p$ bins = 1, ϕ_p bins = 1

	Counting Statistics			
$Q^2 \downarrow$ / W $\rightarrow$	1.7	1.9	2.1	2.3
2.5	2650	2765	-	-
2.0	4205	5357	2074	-
1.5	10080	10368	5760	-
1.0	4954	5472	3686	2074
	Statistical Error			
2.5	$\pm$0.15	$\pm$0.15	-	-
2.0	$\pm$0.12	$\pm$0.11	$\pm$0.17	-
1.5	$\pm$0.08	$\pm$0.08	$\pm$0.11	-
1.0	$\pm$0.11	$\pm$0.11	$\pm$0.13	$\pm$0.17

Scenario #5: Q^2 bin = $\pm$ 0.25 GeV^2, W bin = $\pm$ 0.2 GeV
$\cos\Theta_K$ bins = 4, ϕ_K bins = 1
$\cos\Theta_p$ bins = 1, ϕ_p bins = 1

	Counting Statistics	
$Q^2 \downarrow$ / W $\rightarrow$	1.8	2.2
2.5	5415	-
2.0	9562	2074
1.5	20448	5760
1.0	10426	5760
	Statistical Error	
2.5	$\pm$0.11	-
2.0	$\pm$0.08	$\pm$0.17
1.5	$\pm$0.06	$\pm$0.11
1.0	$\pm$0.08	$\pm$0.11

Scenario #6: Q^2 bin = $\pm$ 0.5 GeV^2, W bin = $\pm$ 0.2 GeV
$\cos\Theta_K$ bins = 4, ϕ_K bins = 1
$\cos\Theta_p$ bins = 1, ϕ_p bins = 1

	Counting Statistics	
$Q^2 \downarrow$ / W $\rightarrow$	1.8	2.2
2.25	14977	2074
1.25	30874	11520
	Statistical Error	
2.25	$\pm$0.07	$\pm$0.17
1.25	$\pm$0.05	$\pm$0.08

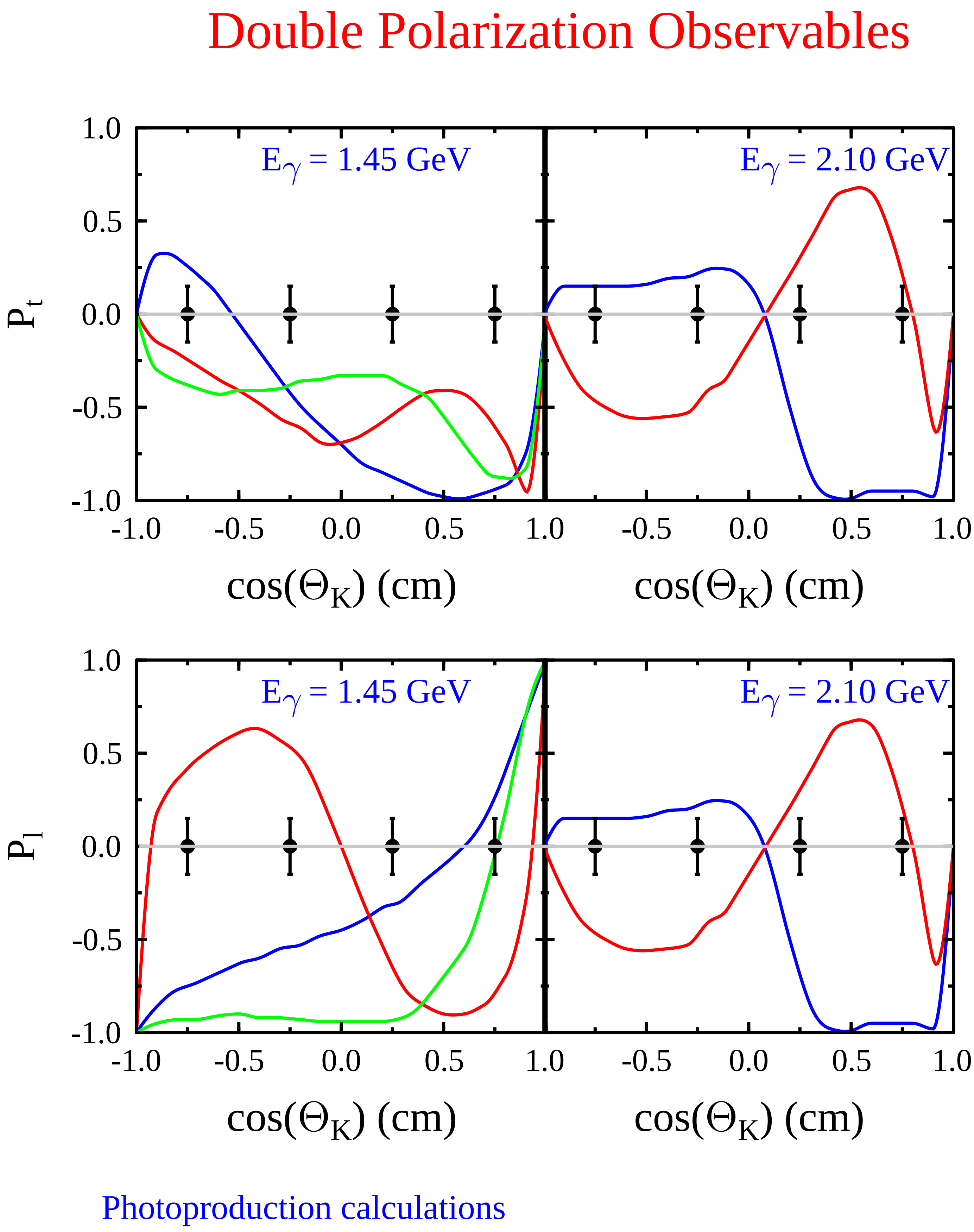

Figure 1: Double polarization observables with ± 0.15 statistical error bars.