TGC Measurement in $e^+e^- \to W^+W^- \to 4q$ using total σ and angular distributions

Status Report

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DELPHI week

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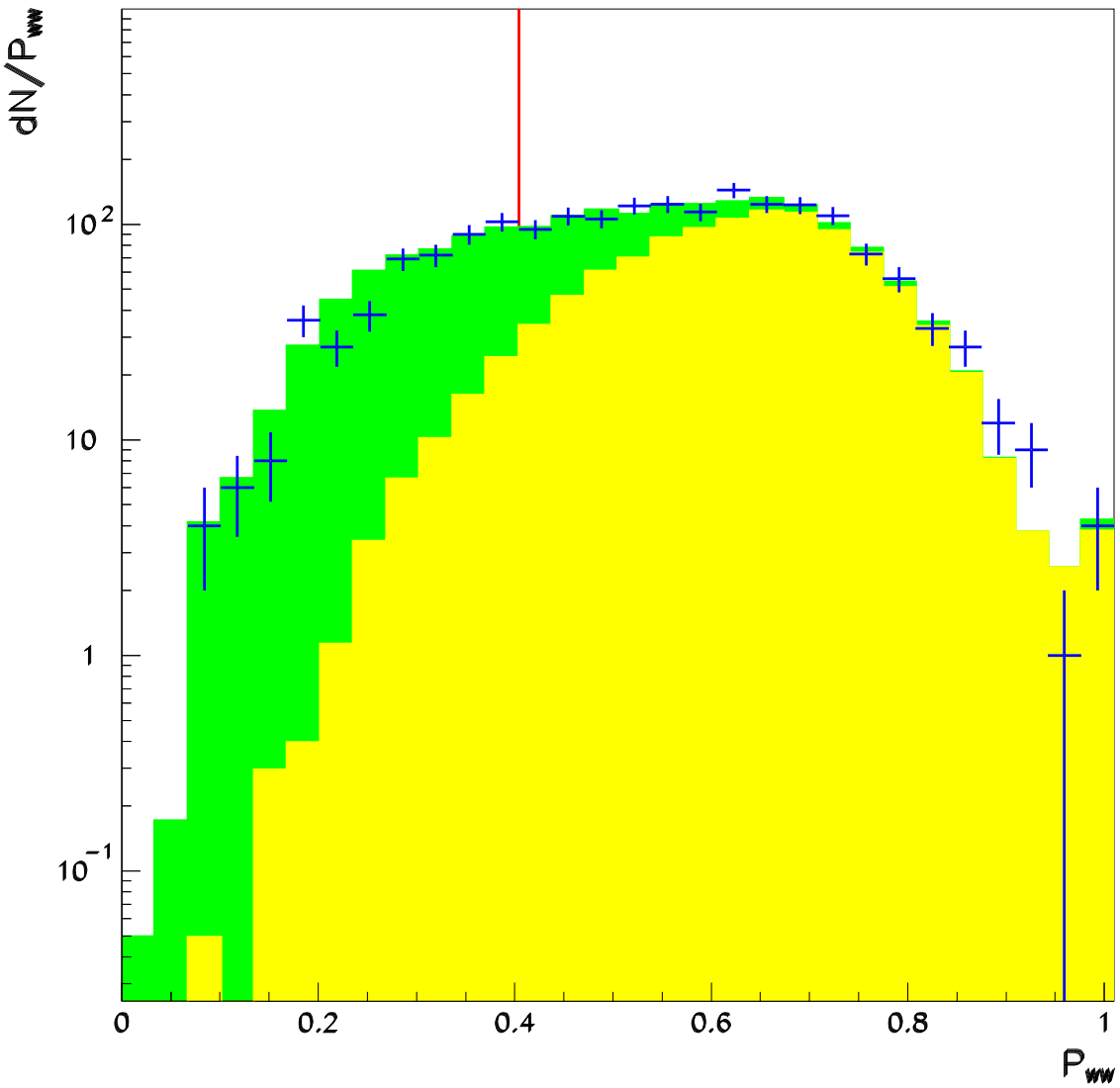
Status

Status:

- First results for 189 data
- D2 data processing, no run selection, $L = 157.65 pb^{-1}$
- A1 signal MC used.
- No comparison with σ_{Delphi} yet
- Some systematics

Event Selection

Distribution of events according to P_{WW} separator.

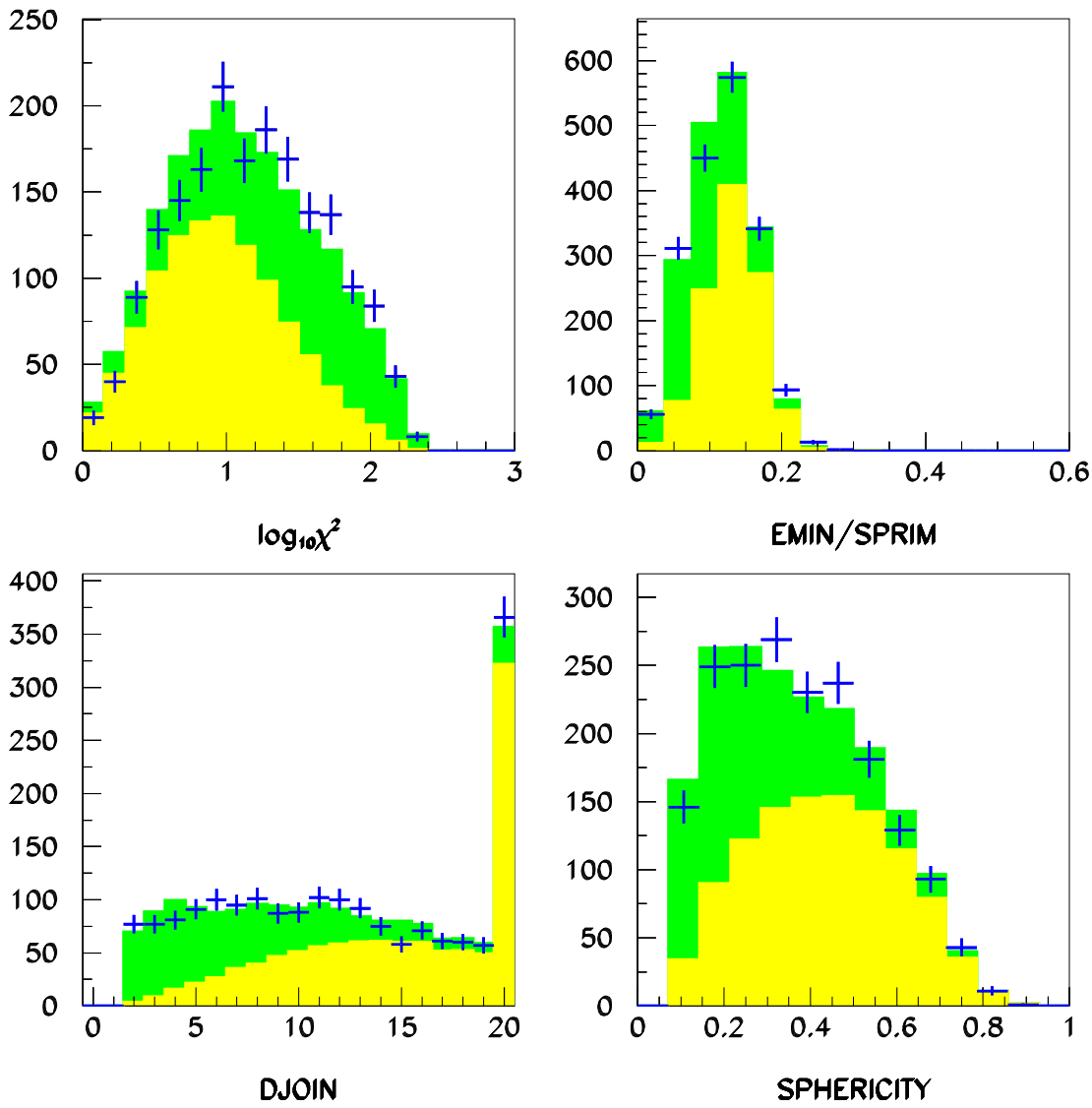


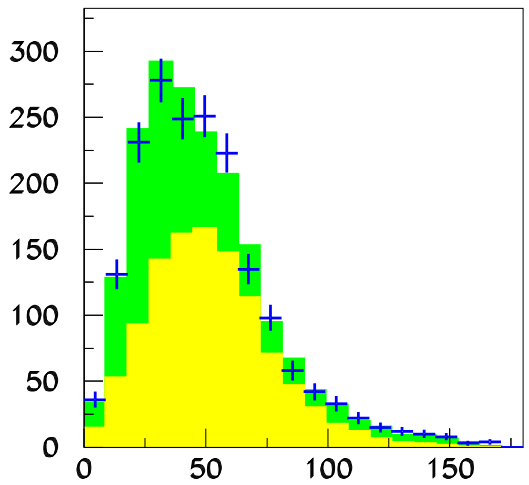
We cut at $P_{WW} = 0.40$ (arrow):

- $\eta = 86.3 \pm 0.3\%$,
- $Pur = 74.5 \pm 4\%$
- 1386 measured events survive the cut.

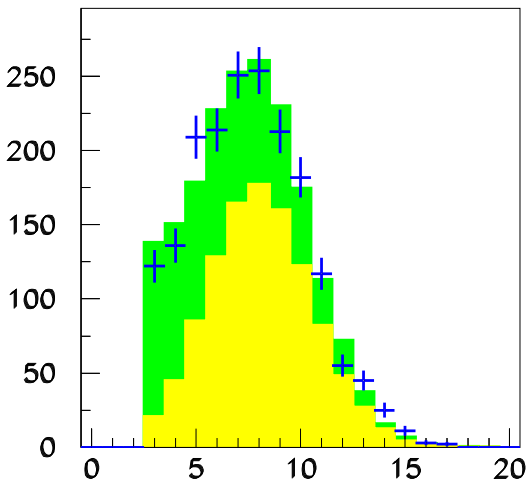
Kinematical distributions

Some kinematical distributions plotted

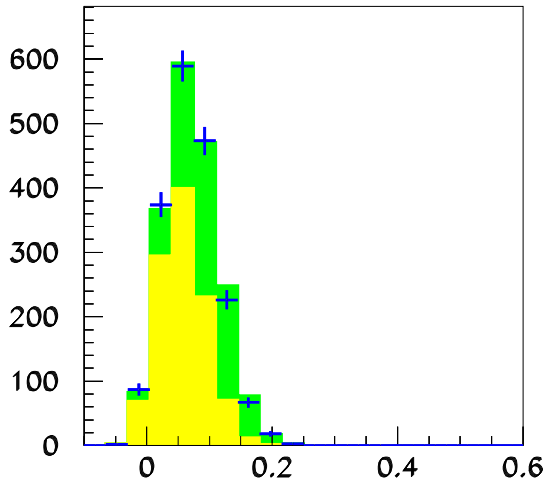




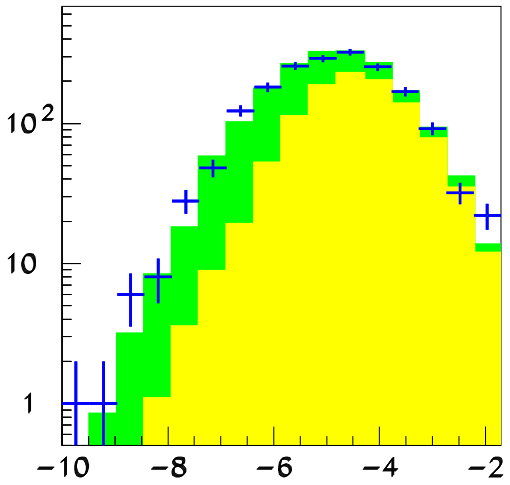
$J_1 - J_2$ FAST



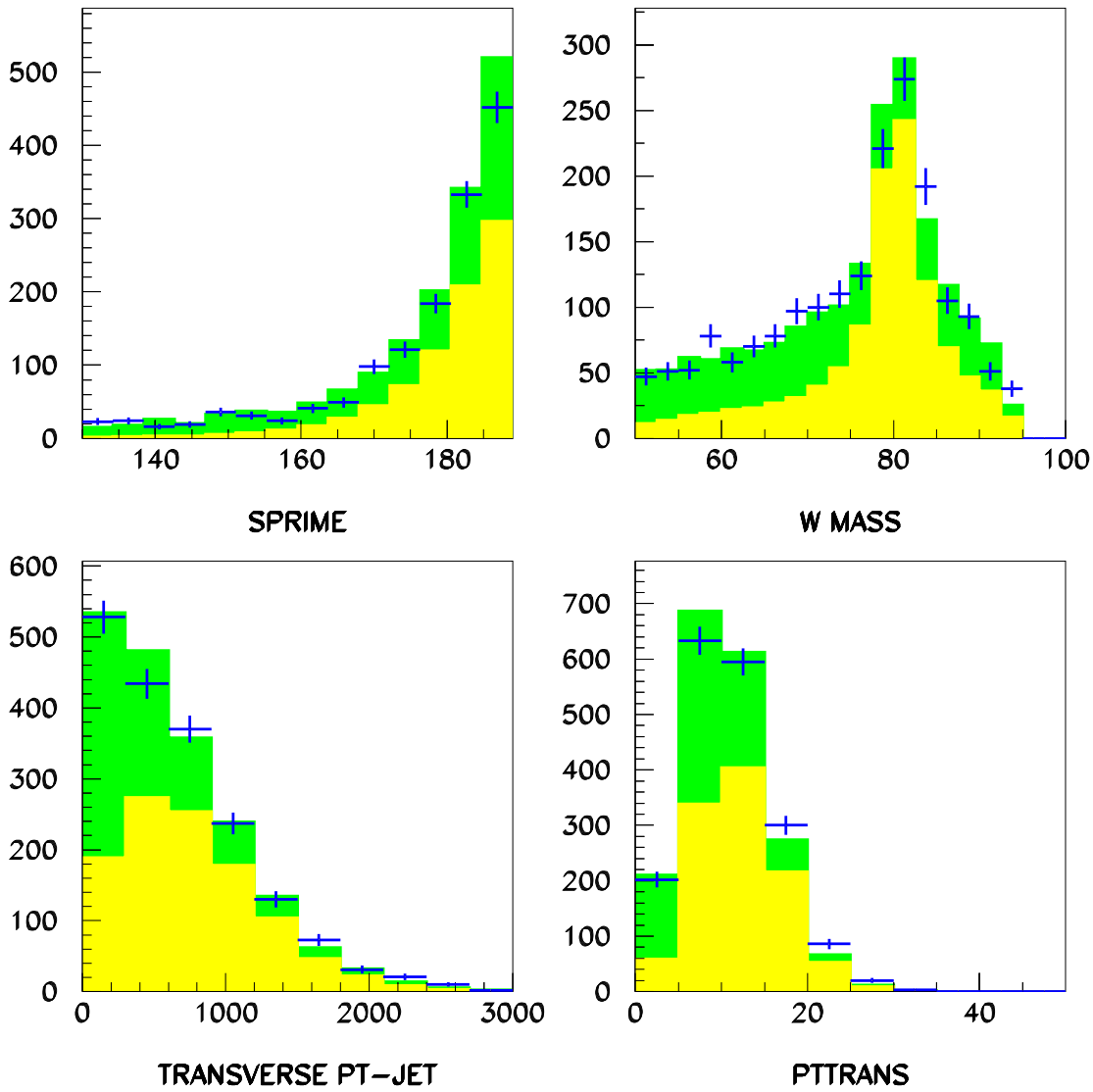
MIN. MULTIPLICITY OF JETS



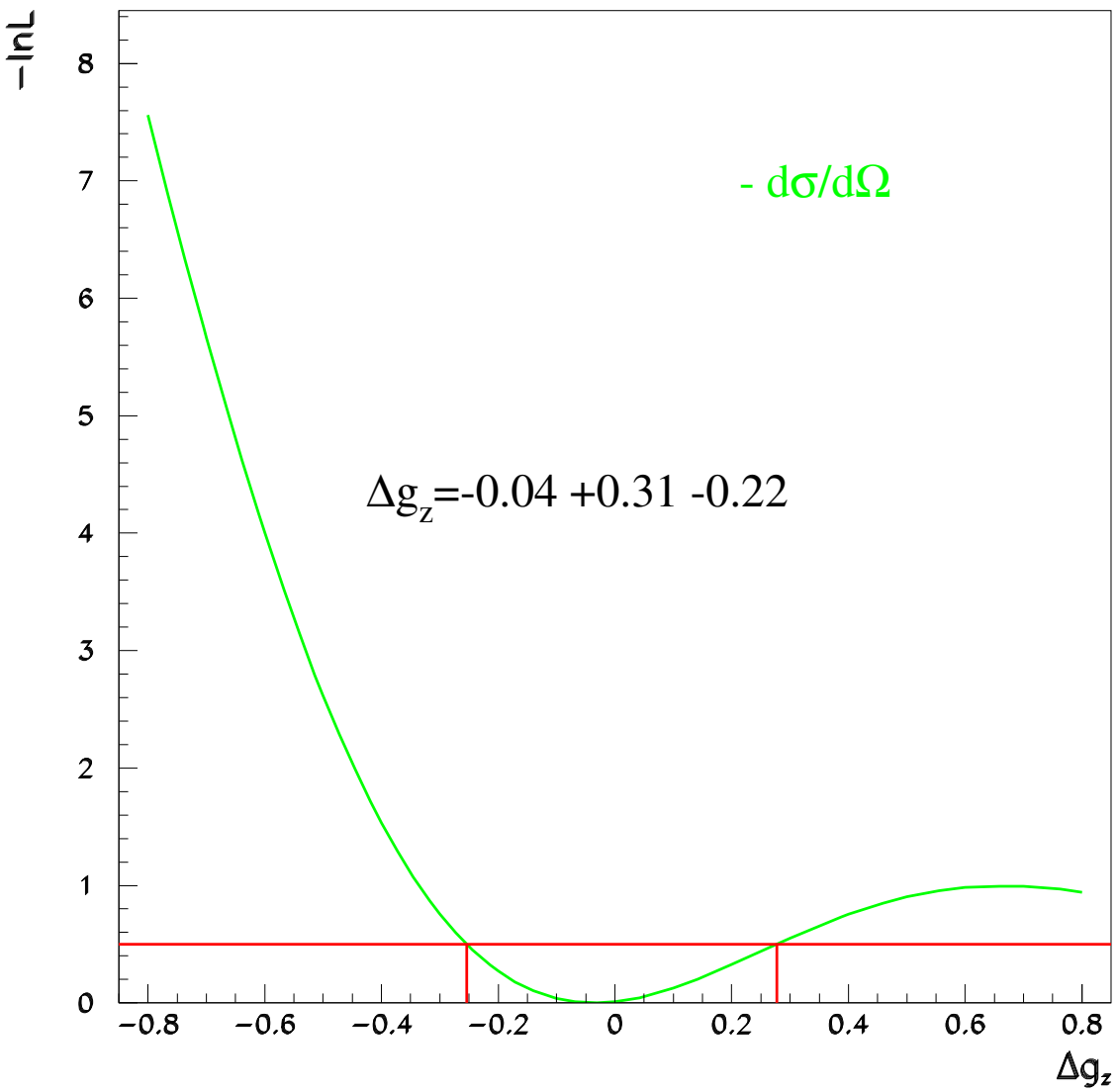
FOX WOLFRAM



LOG D


500
400
300
200
100
0
140
160
180
SPRIME
300
250
200
150
100
50
0
60
80
100
W MASS
600
500
400
300
200
100
0
0
1000
2000
3000
TRANSVERSE PT-JET
700
600
500
400
300
200
100
0
0
20
40
PTTRANS

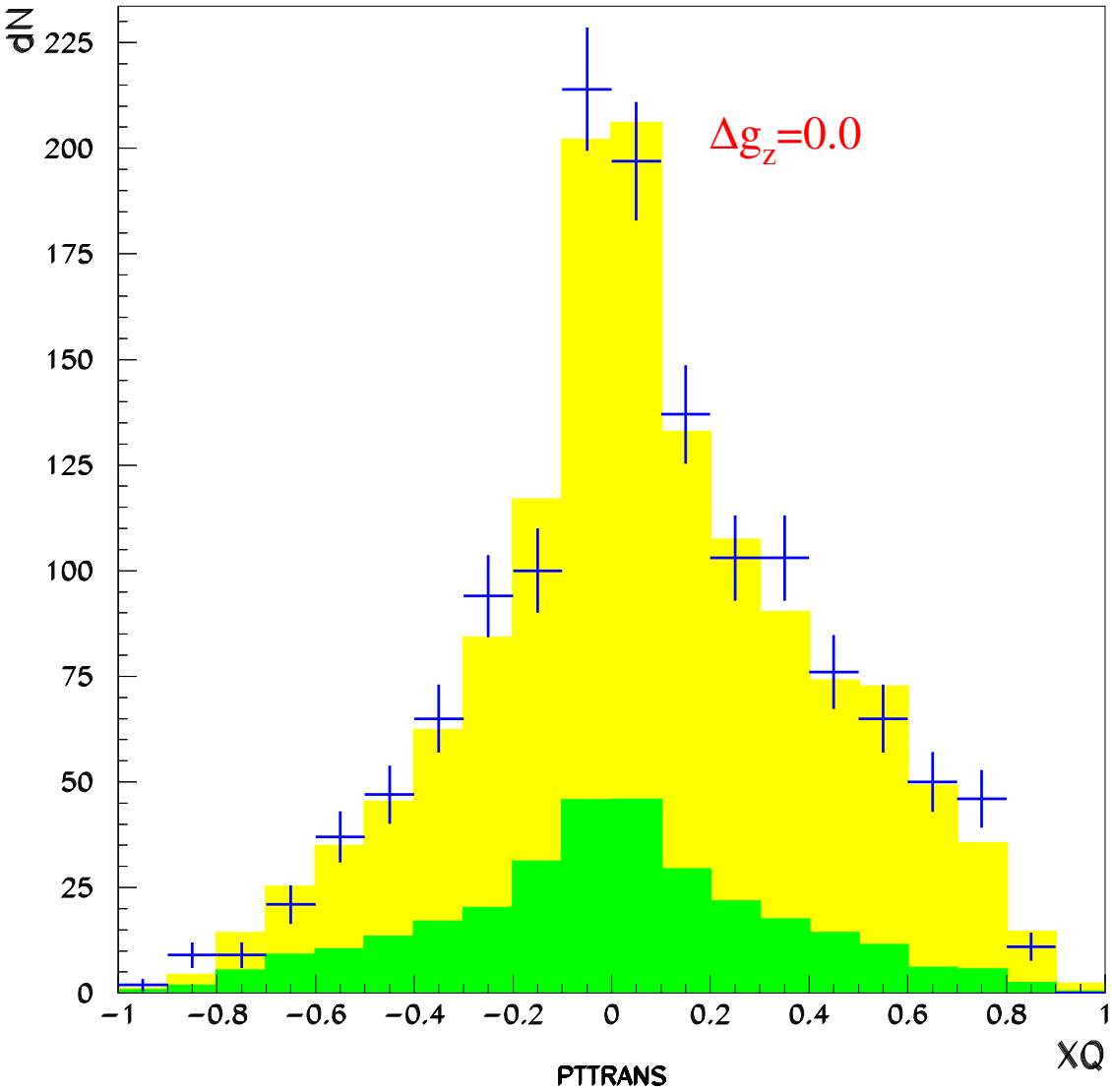
Angular distributions



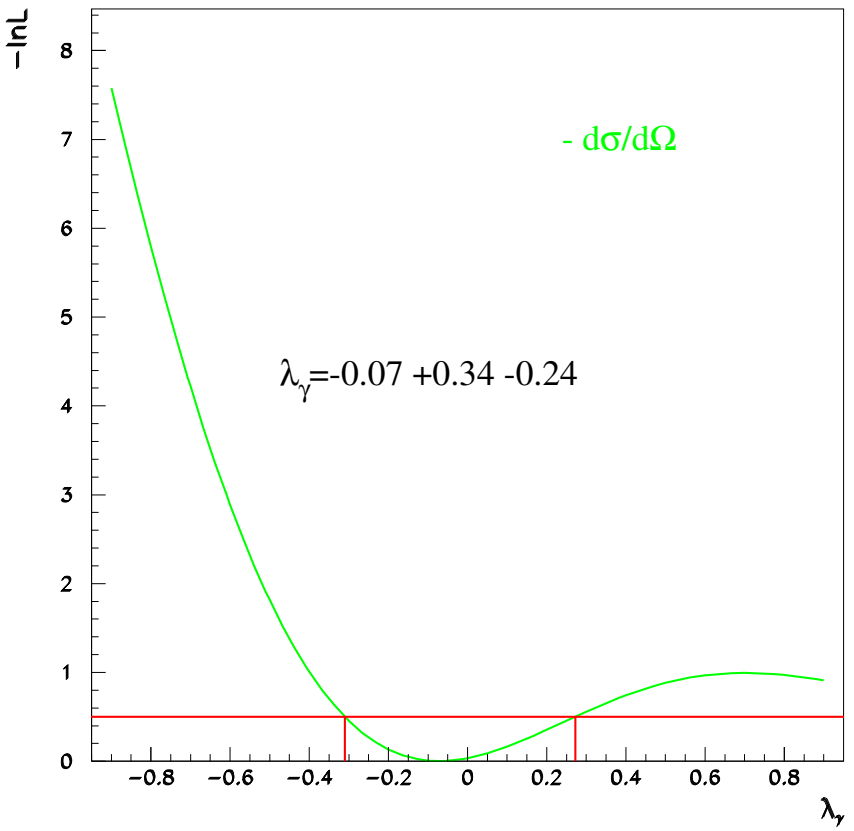
Log likelihood for distribution dependence on Δg_Z^1.

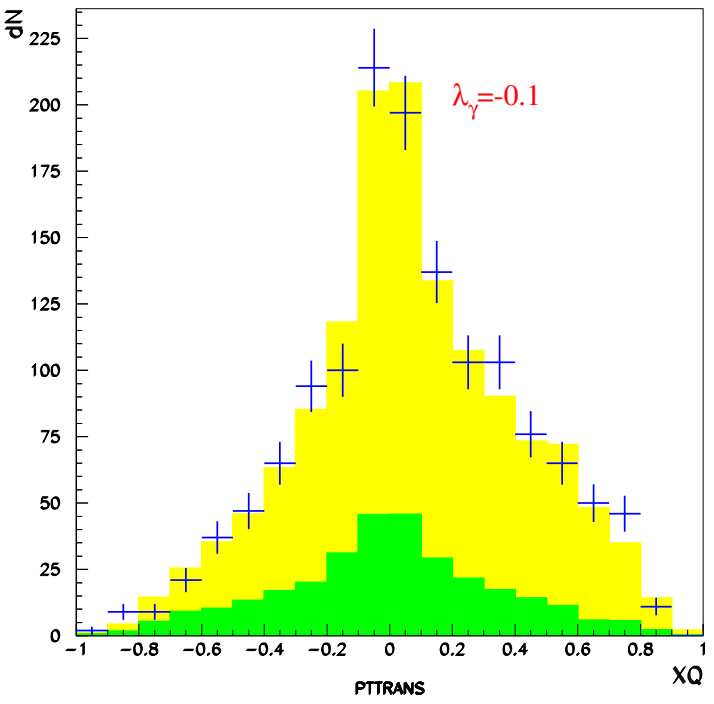
Distribution of charge weighted $\cos\theta_W$:

$$XQ = P_{W-}(\Delta Q)\cos\theta_W - (1 - P_{W-}(\Delta Q))\cos\theta_W$$

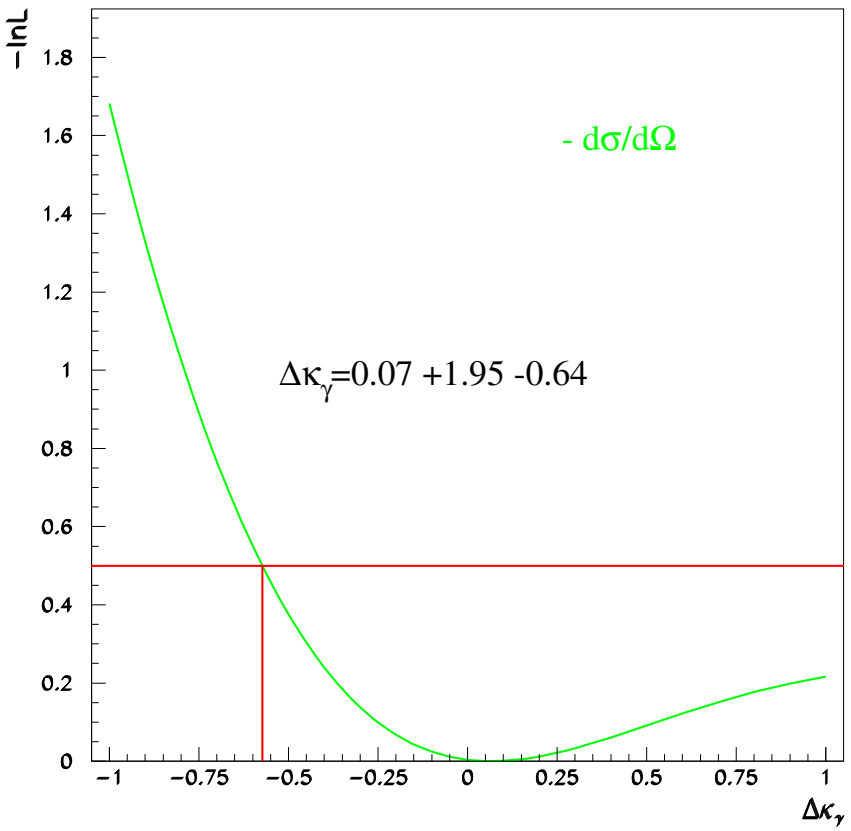


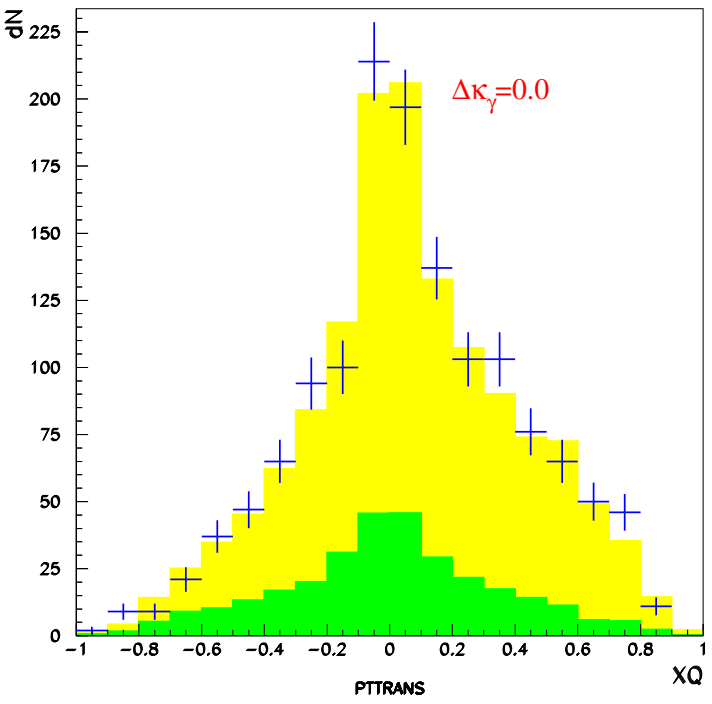
Best data-MC match for $\Delta g_Z^1 = 0.0$.





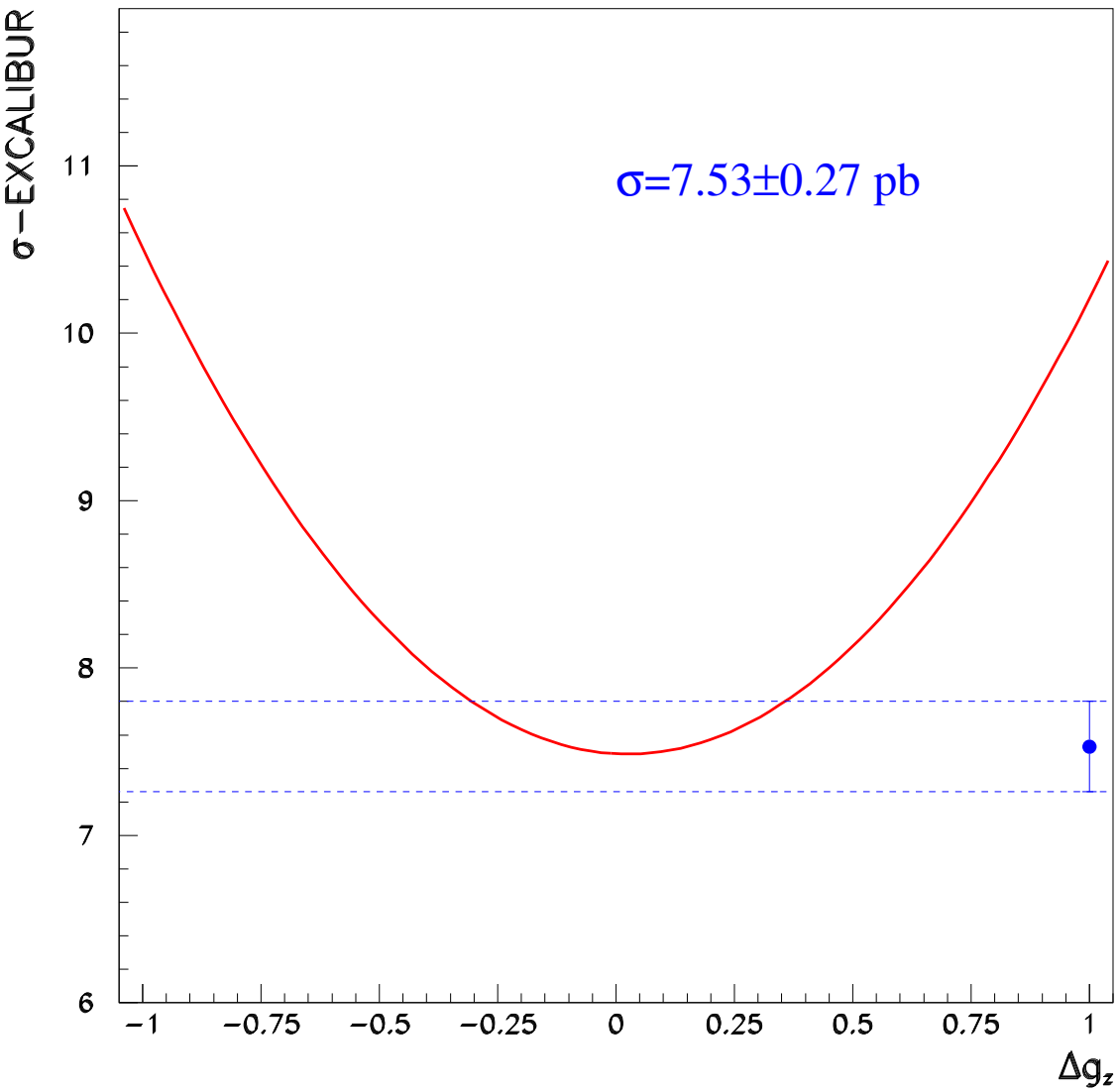
Best data-MC match for $\lambda_\gamma = -0.1$.



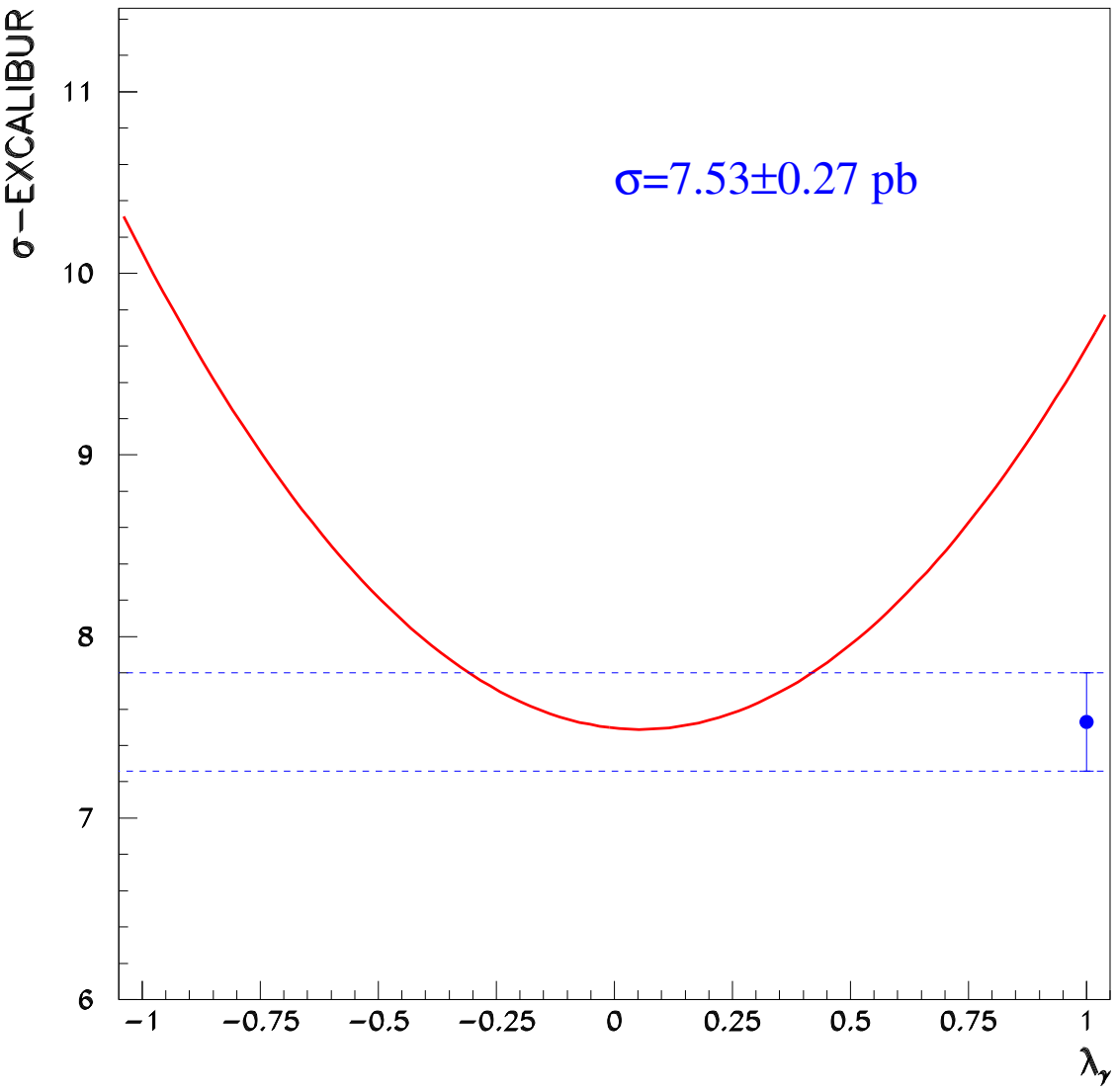


Best data-MC match for $\Delta\kappa_\gamma = 0.0$.

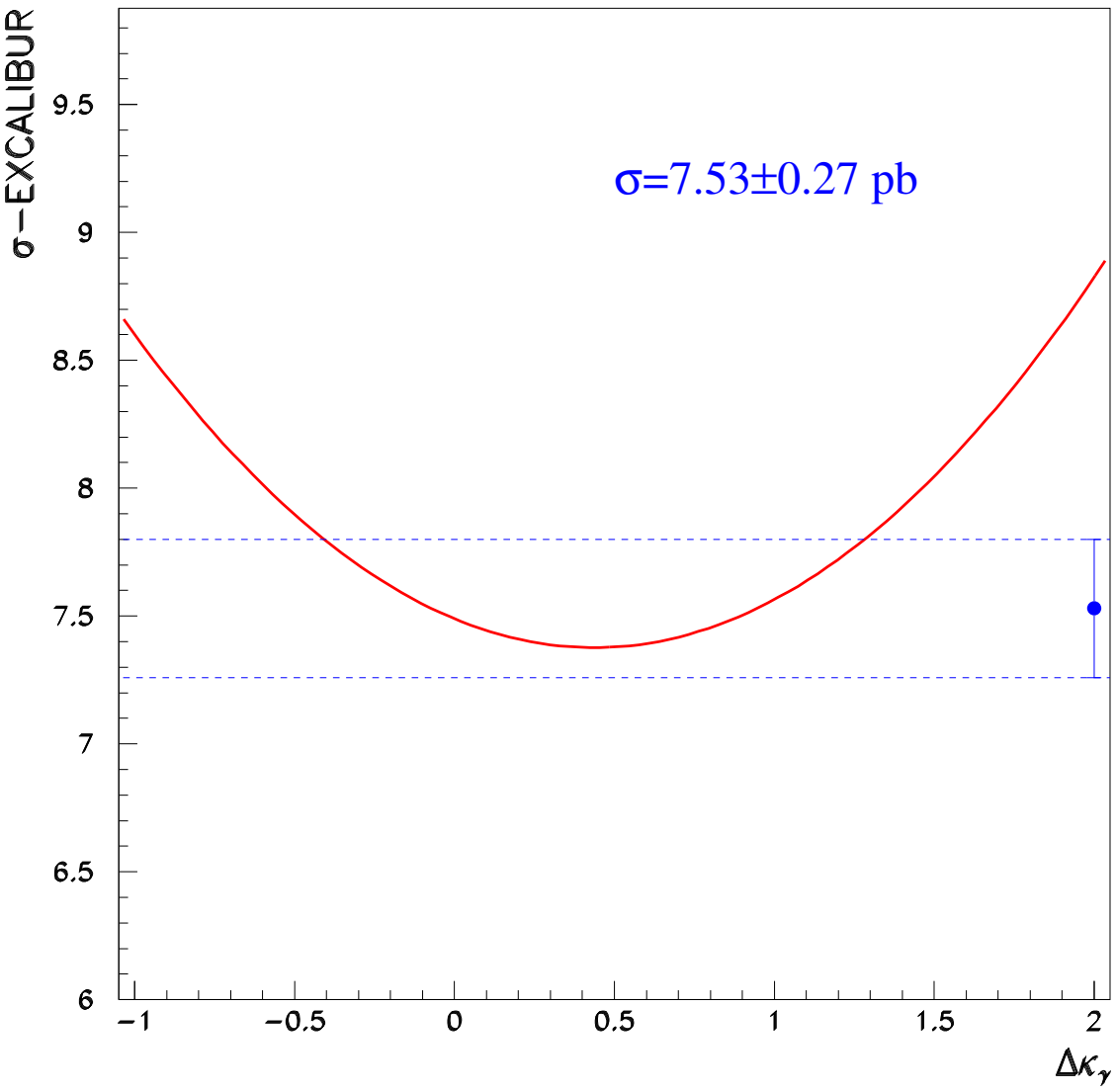
$4q$ cross-section



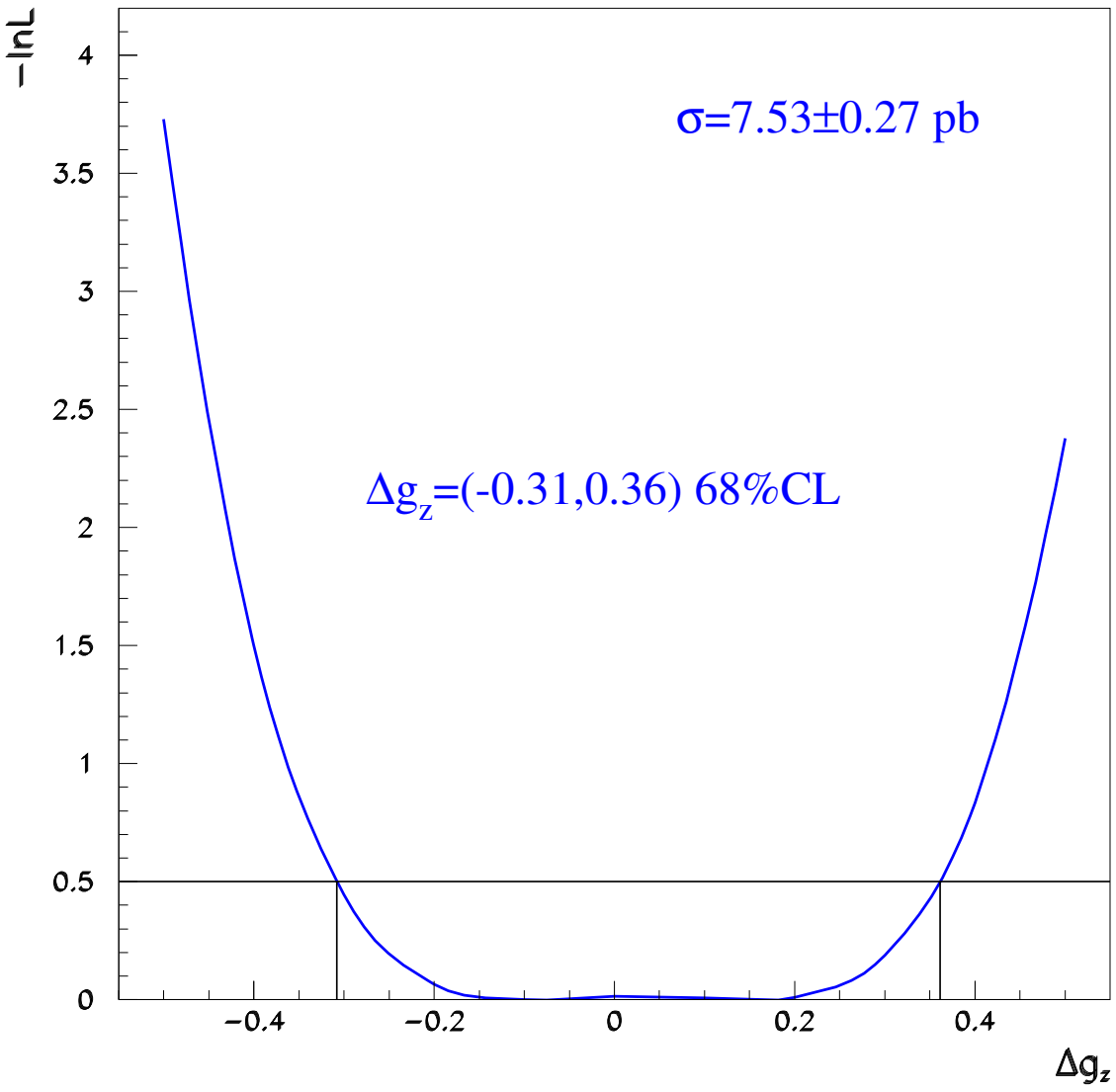
Cross-section dependence on Δg_Z^1.



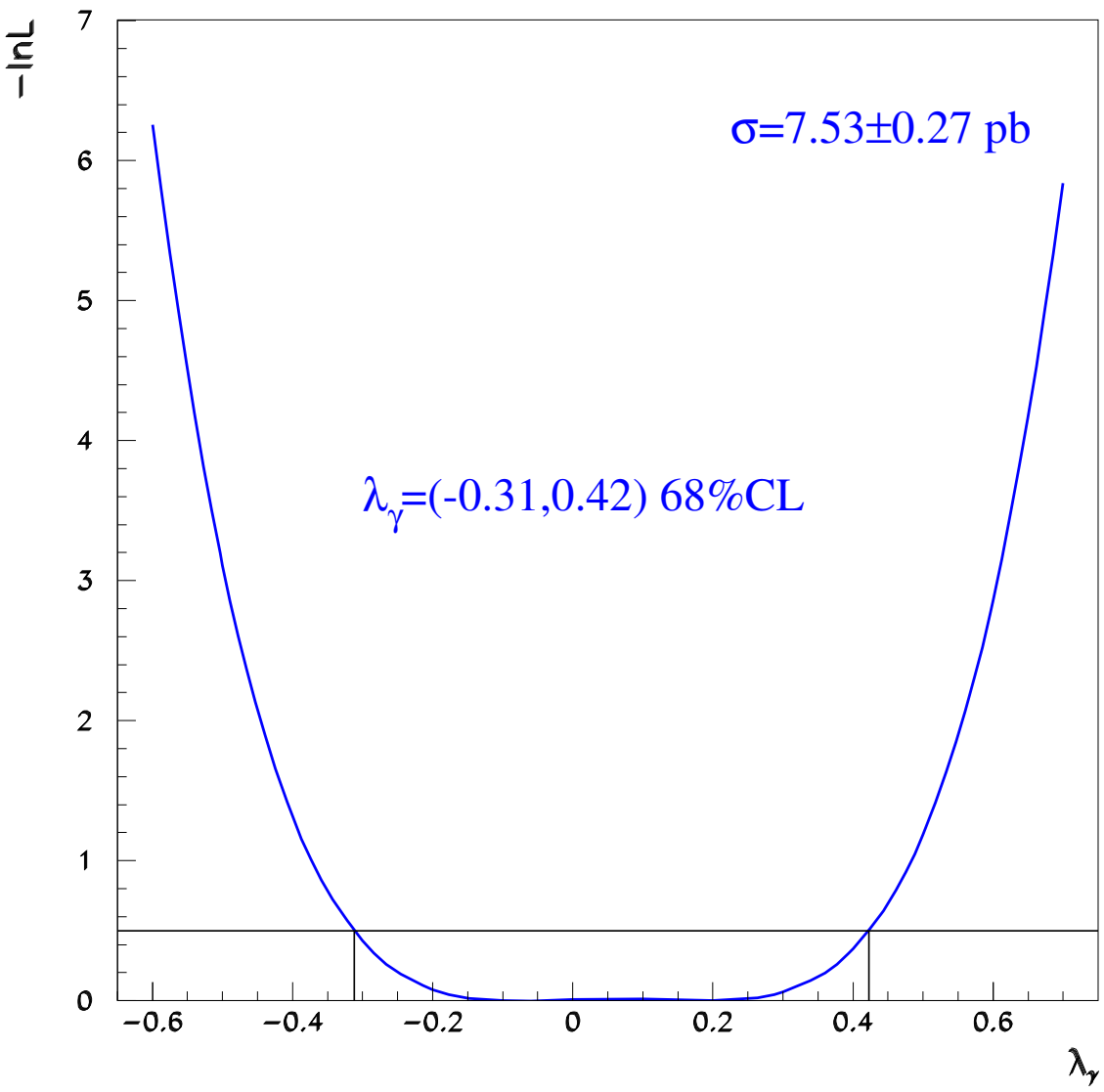
Cross-section dependence on λ_γ.



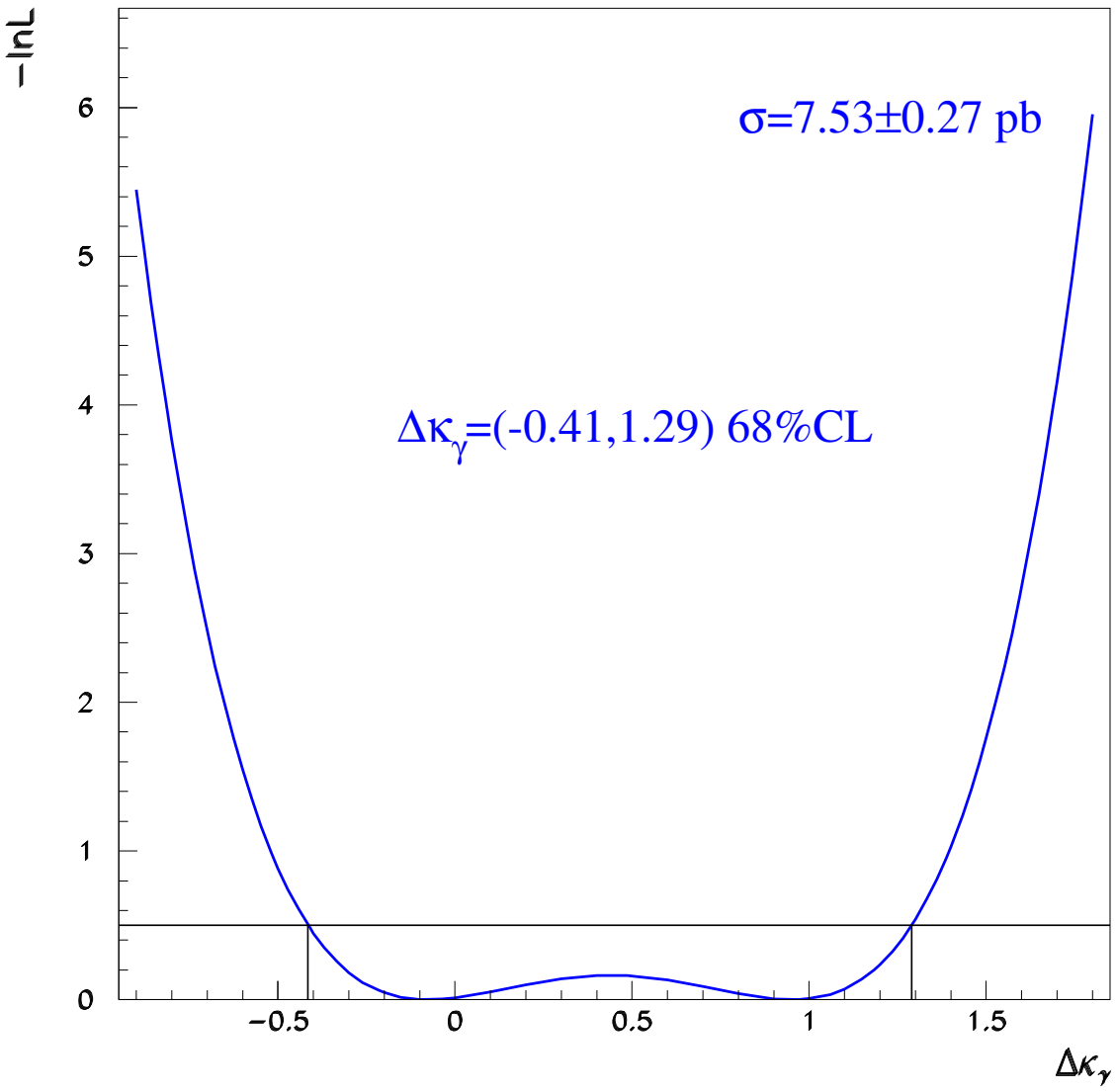
Cross-section dependence on $\Delta\kappa_\gamma$.



Log likelihood for cross-section dependence on Δg_Z^1.

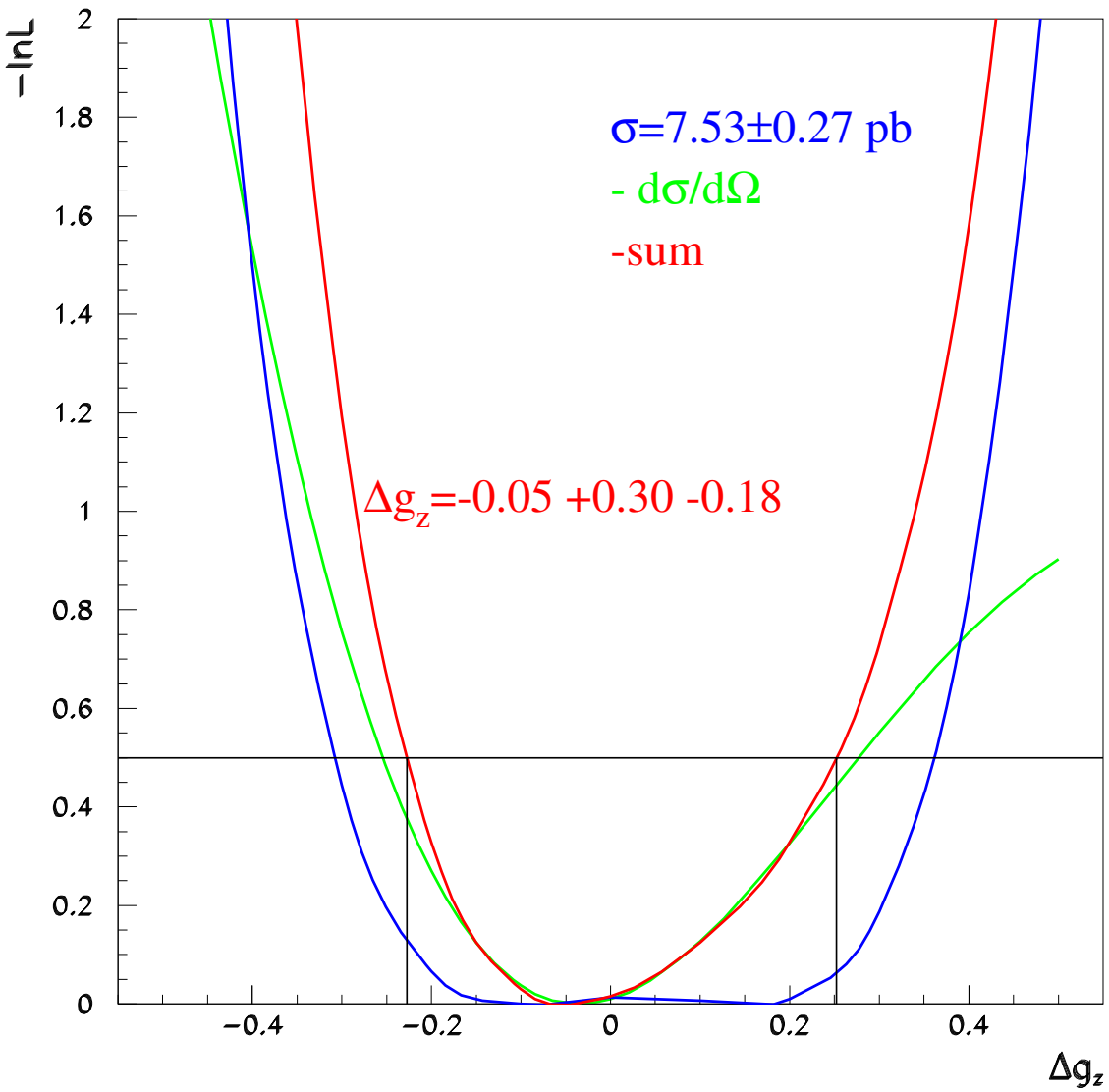


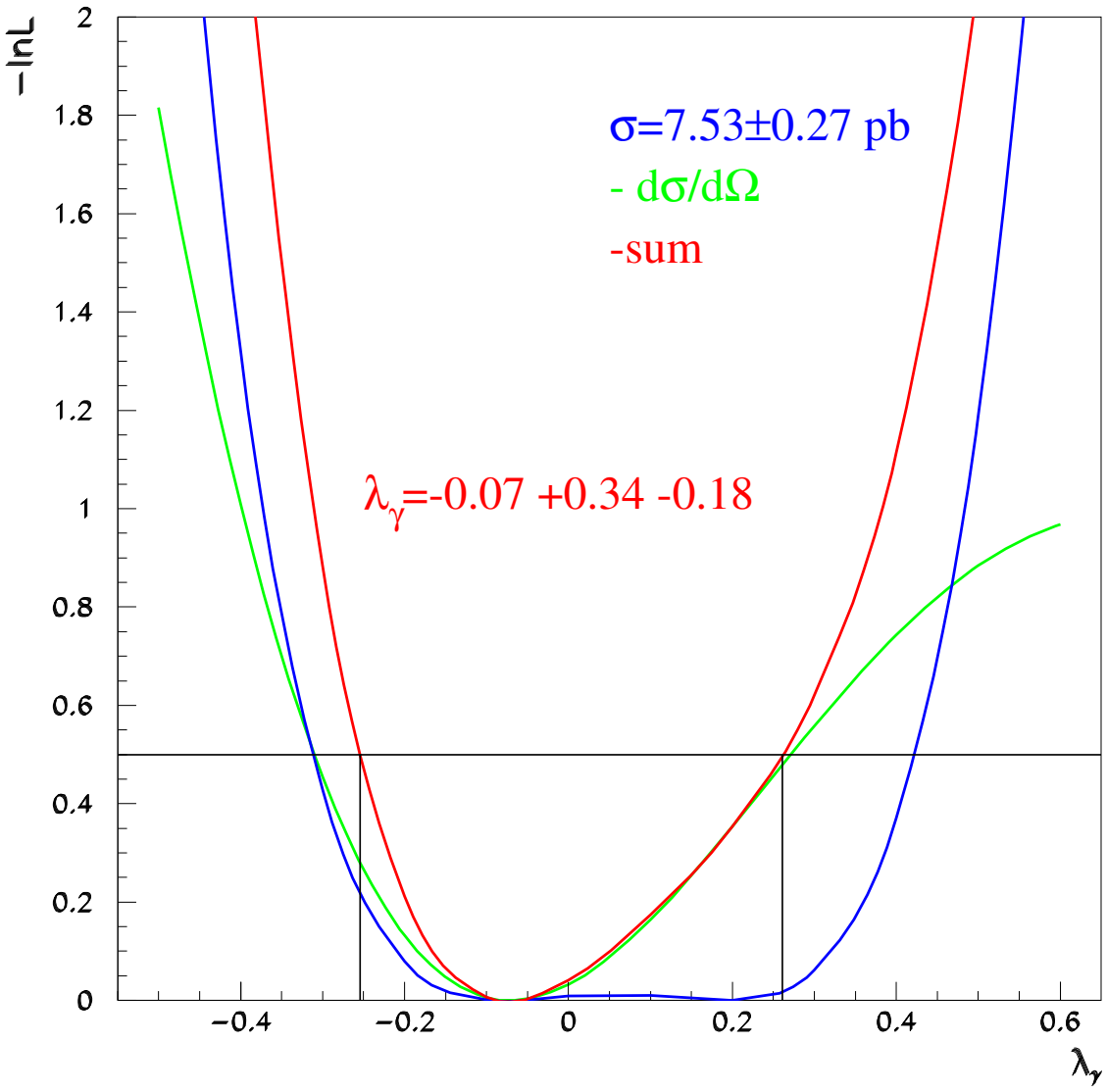
Log likelihood for cross-section dependence on λ_γ.



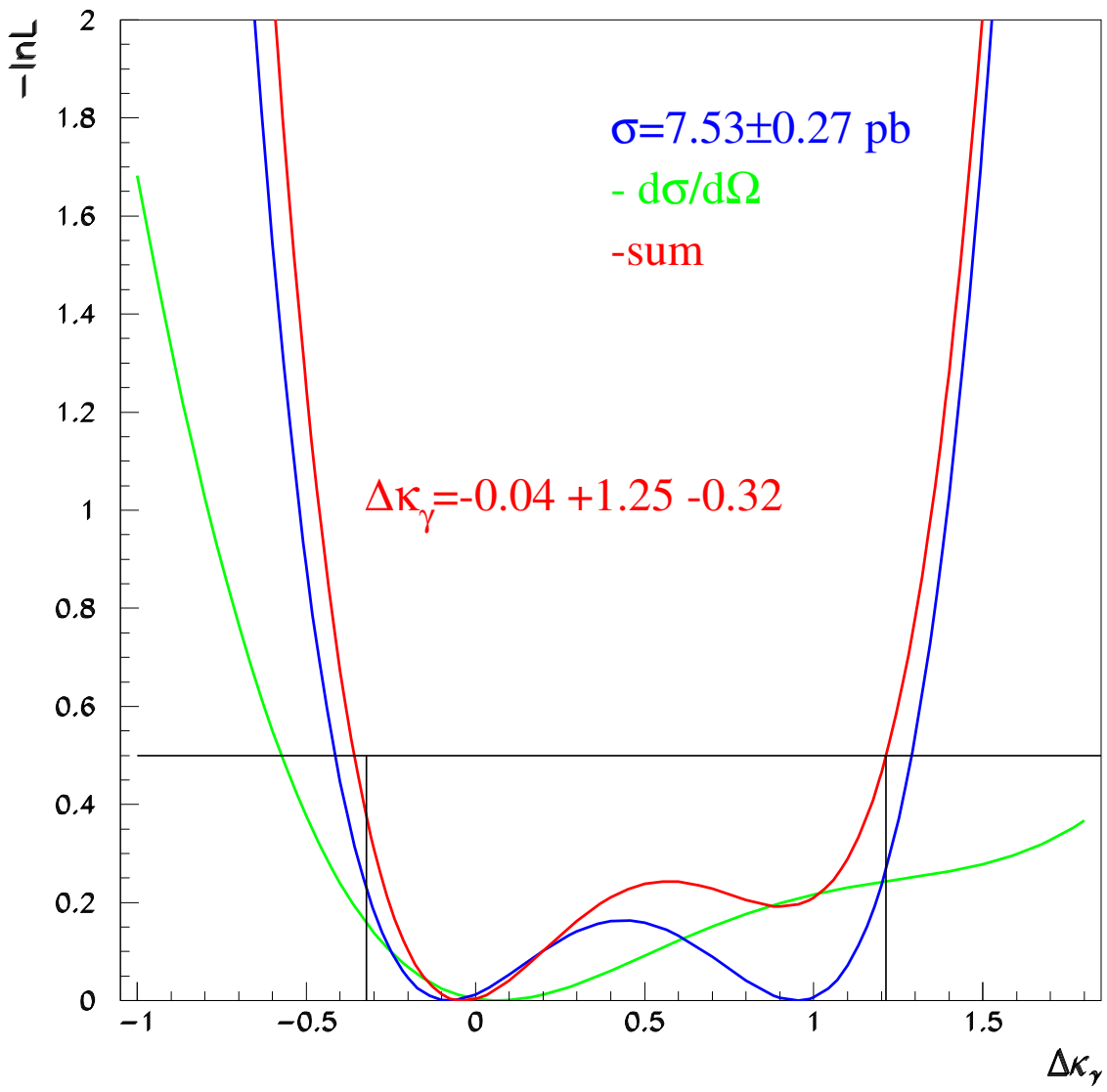
Log likelihood for cross-section dependence on $\Delta\kappa_\gamma$.

Combined results





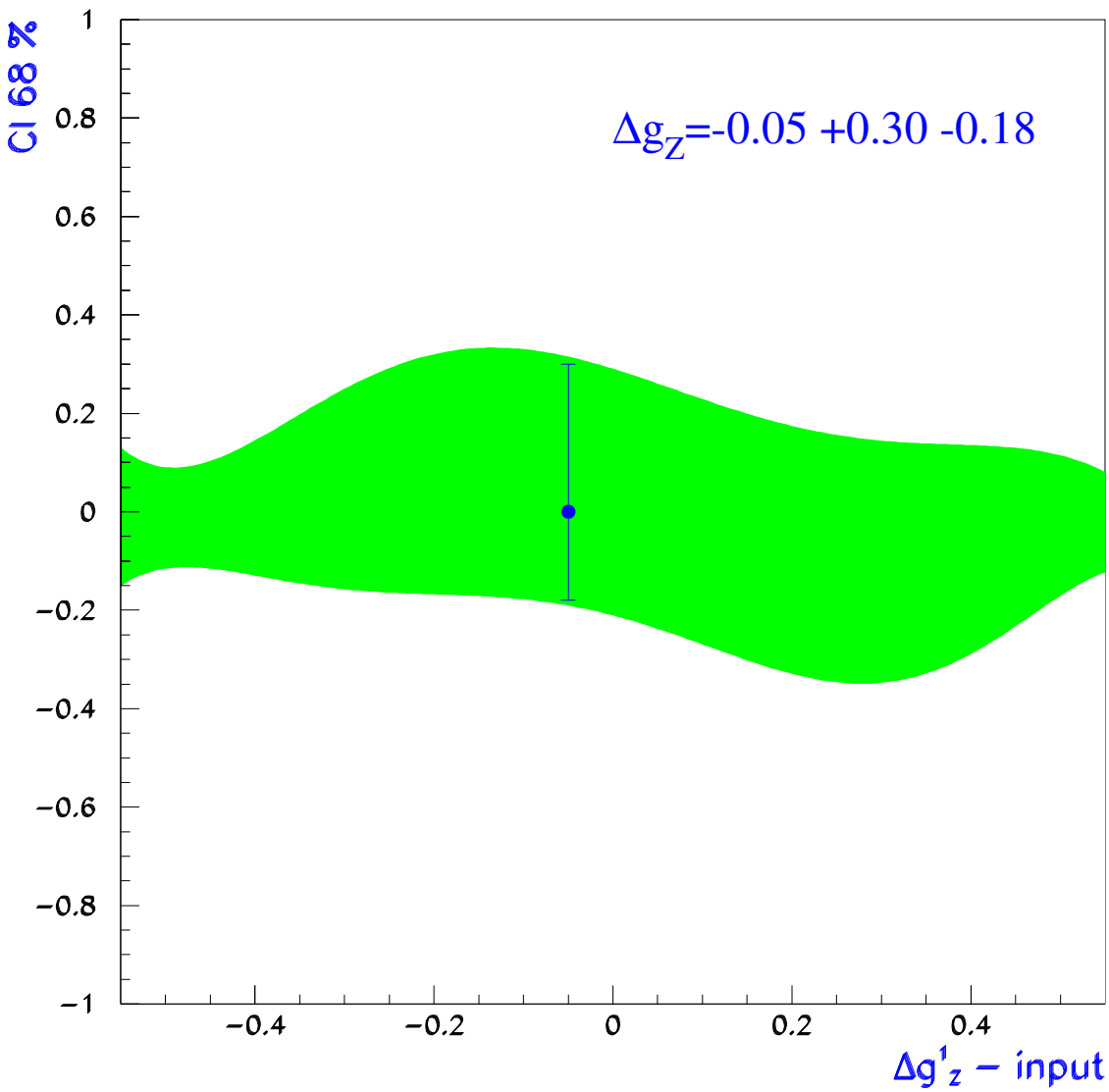
Combined log likelihood for λ_γ using distribution and cross-section dependence.



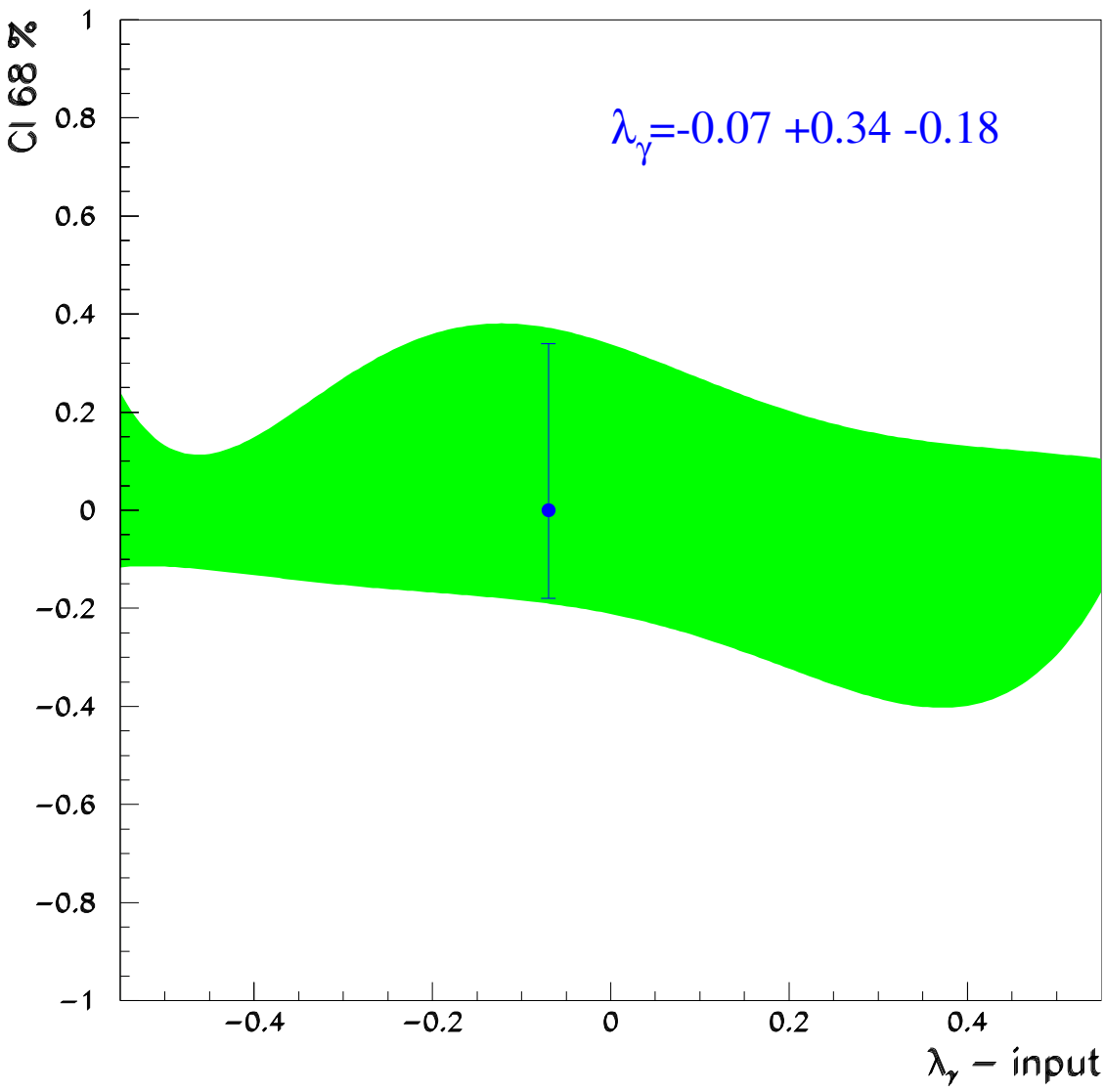
Combined log likelihood for $\Delta\kappa_\gamma$ using distribution and cross-section dependence.

Expected errors

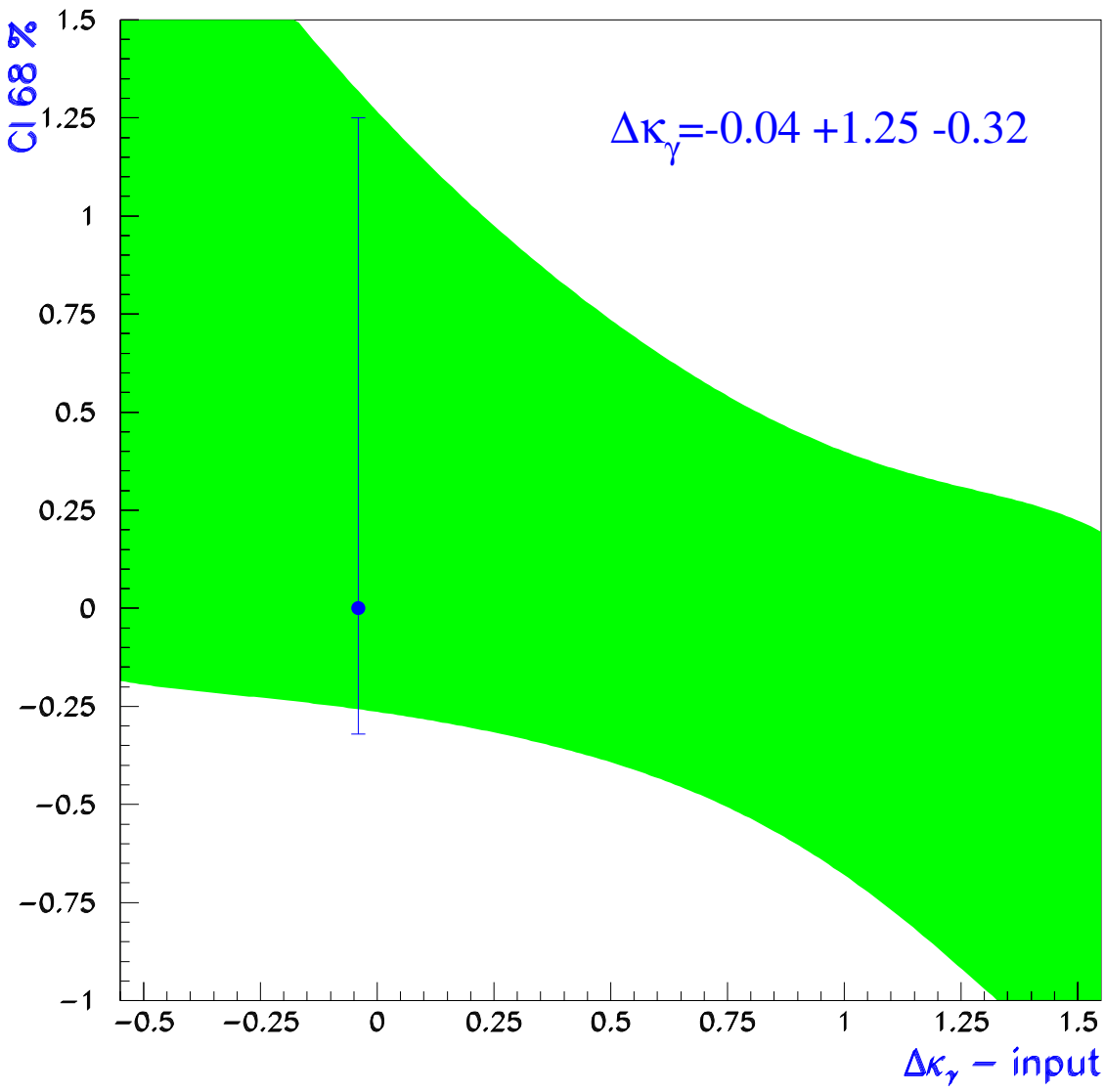
Distribution of expected errors according to TGC parameters. The green area is the expected error of folded $\cos\theta_{W-}$. The obtained result is drawn as a blue error bar.



Expected errors for Δg_Z^1.



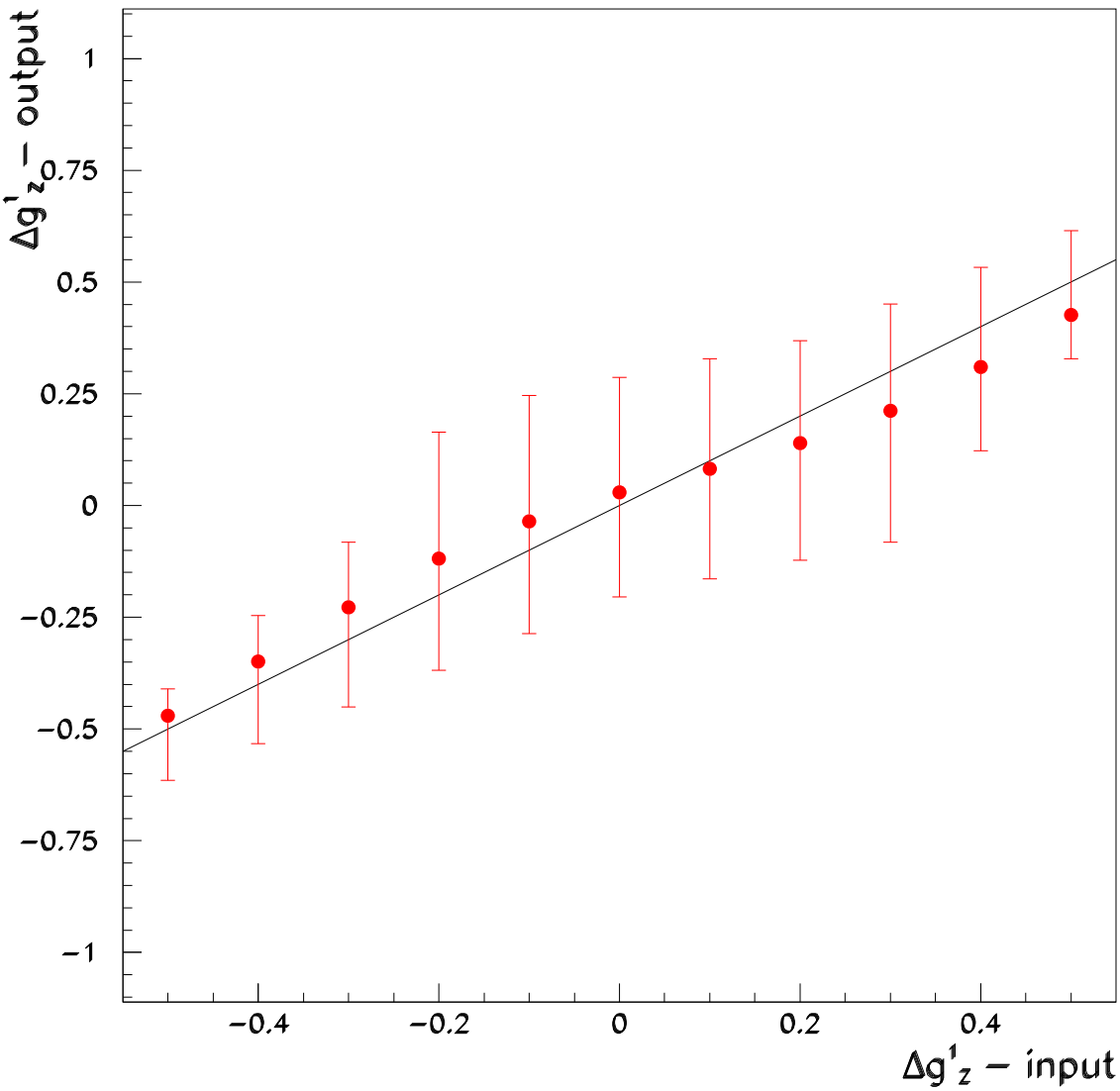
Expected errors for λ_γ.



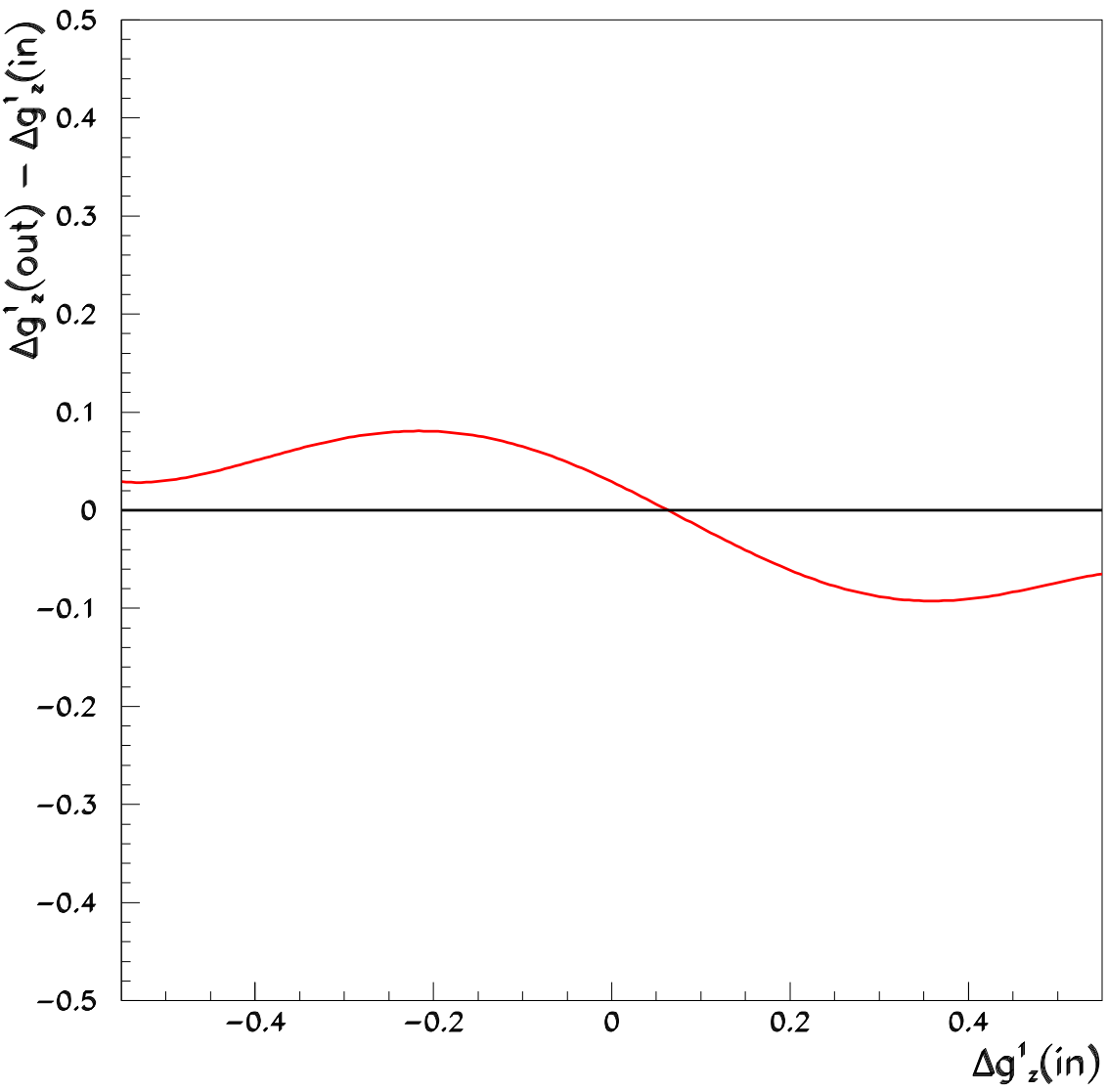
Expected errors for $\Delta\kappa_\gamma$.

Bias

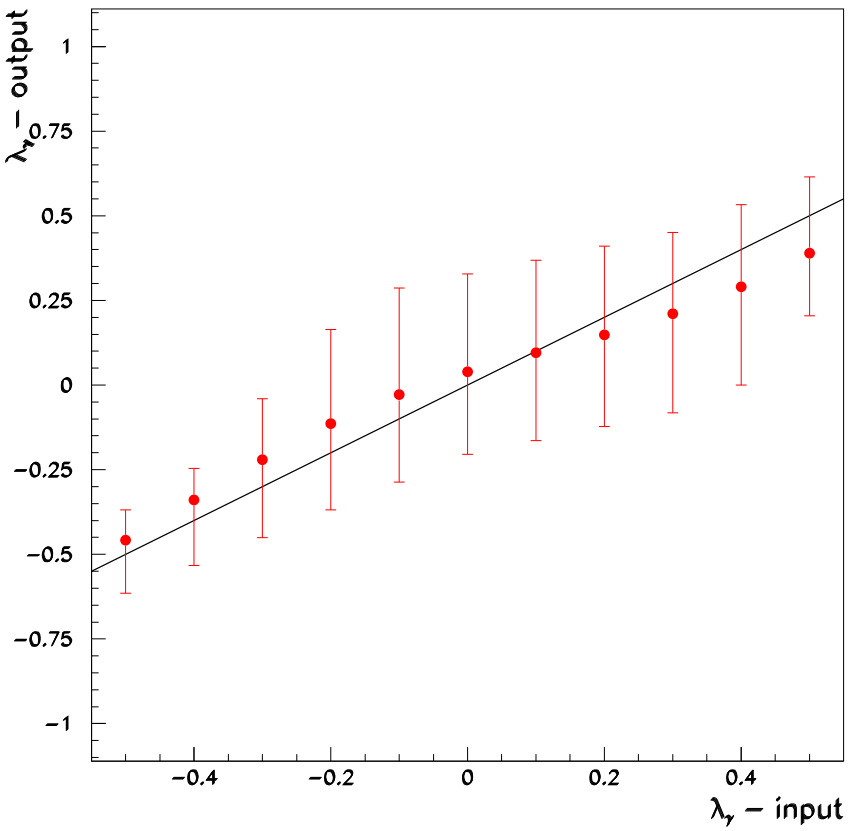
- Extended max. likelihood
- 10000 *fast* MC experiments

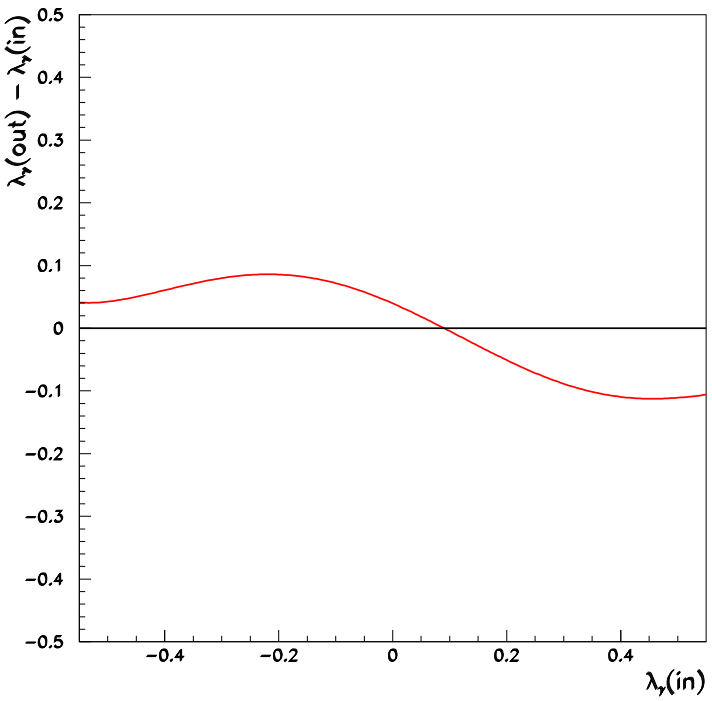


Expected values and errors for Δg_Z^1.

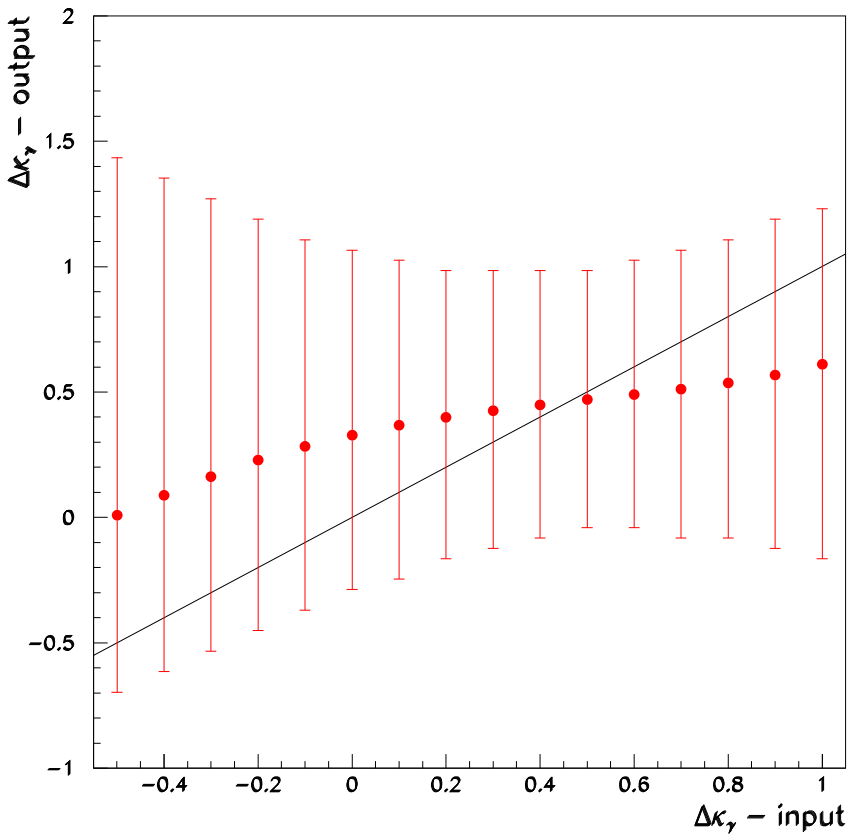


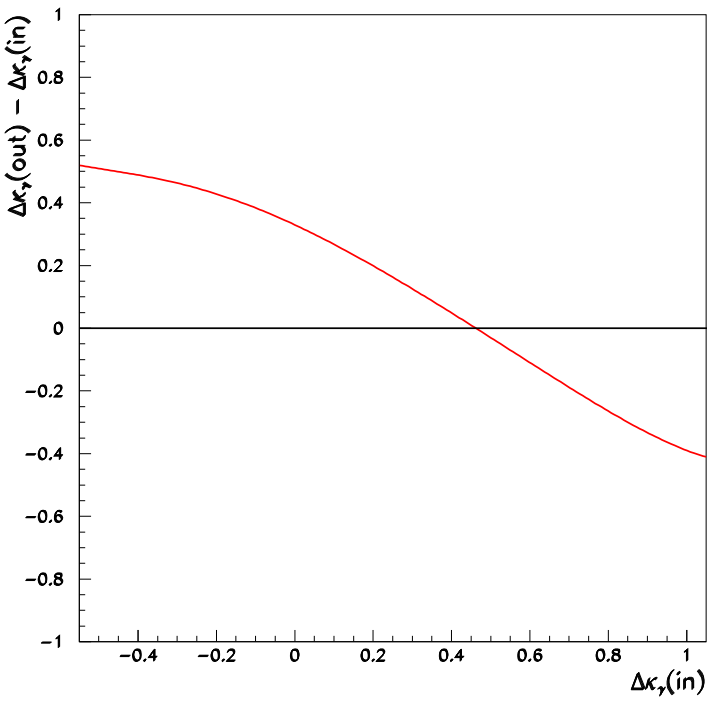
Bias for Δg_Z^1.





Bias for λ_γ.

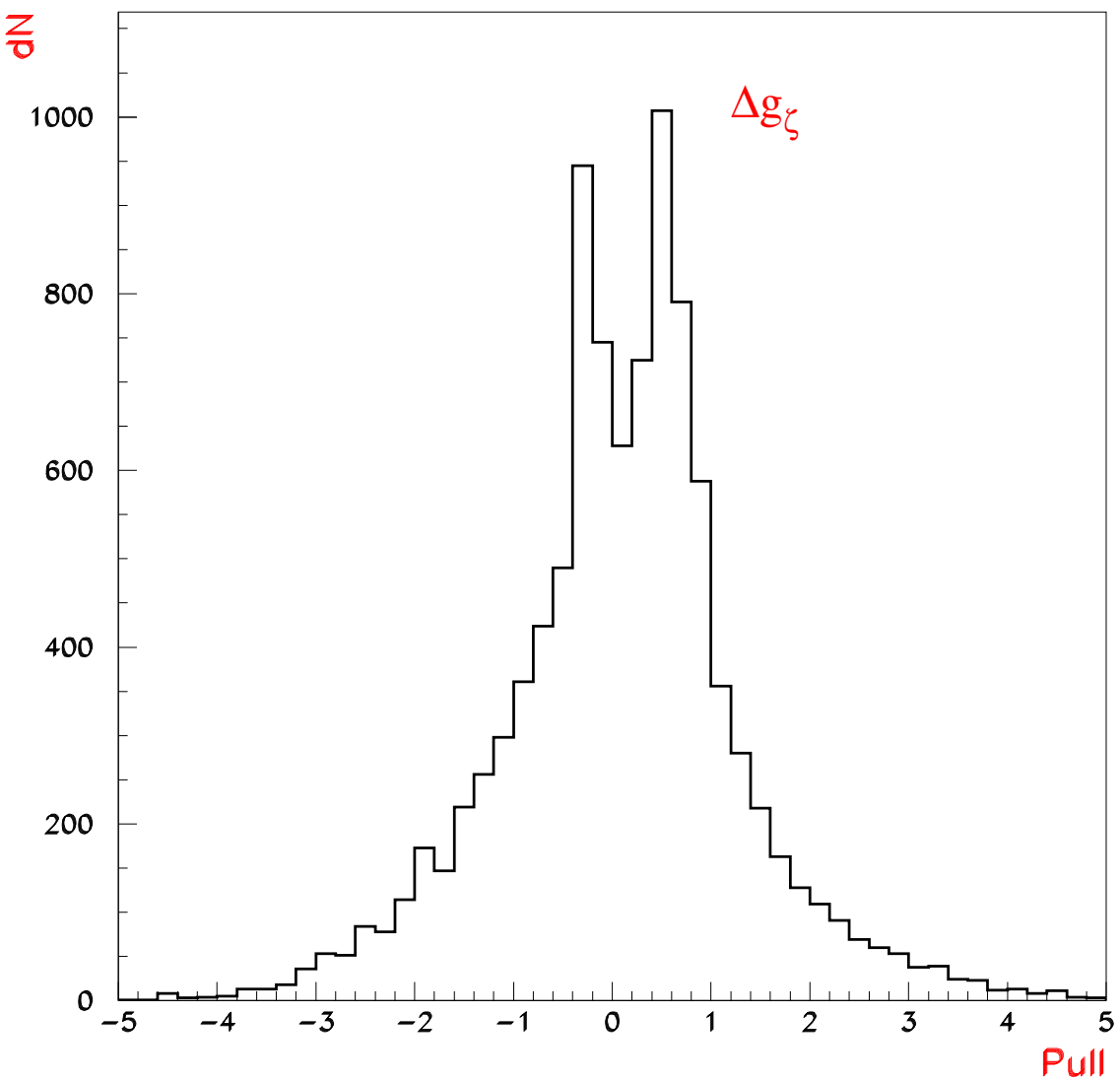




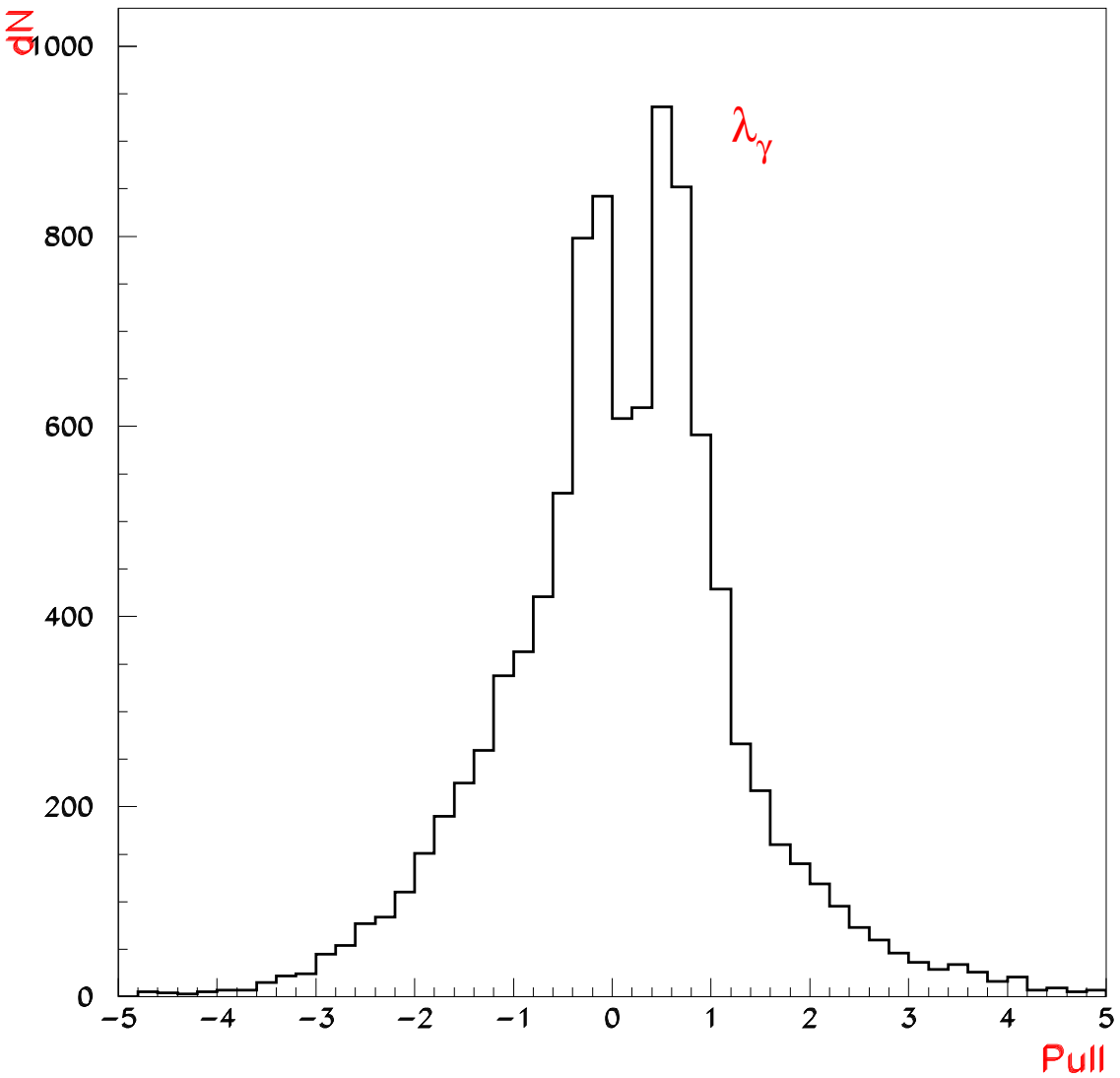
Bias for $\Delta\kappa_\gamma$=.

Pulls

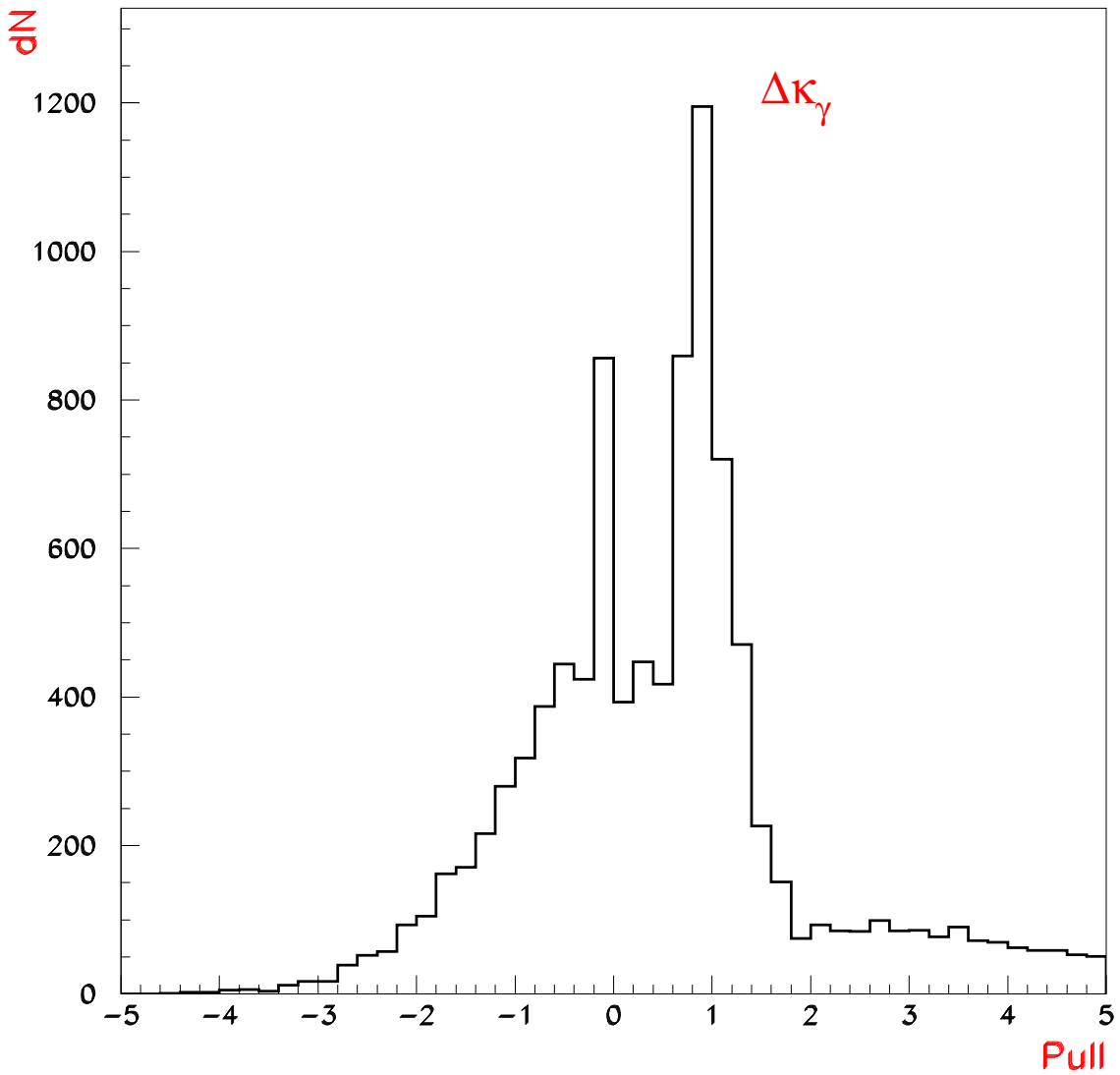
- Extended max. likelihood
- 10000 MC experiments (SM)
- asym. errors taken into account



Pull for Δg_Z^1.



Pull for λ_γ.



Pull for $\Delta\kappa_\gamma$.

Systematics

Source	Δg_z	λ_γ	$\Delta\kappa_\gamma$
$M_W \pm 0.1$ GeV	0.02	0.03	0.03
Lumi.(1%)	0.04	0.04	0.13
Eff. (4%)	0.09	0.11	0.32
$P_Q \pm 0.01$	0.01	0.02	0.05
σ_{bkg} (5%)	0.03	0.03	0.06
σ_{sig} (2%)	0.04	0.04	0.07
MC stat. (1σ)	0.07	0.06	0.12
combined	$\pm$ 0.13	0.15	0.38

Missing:

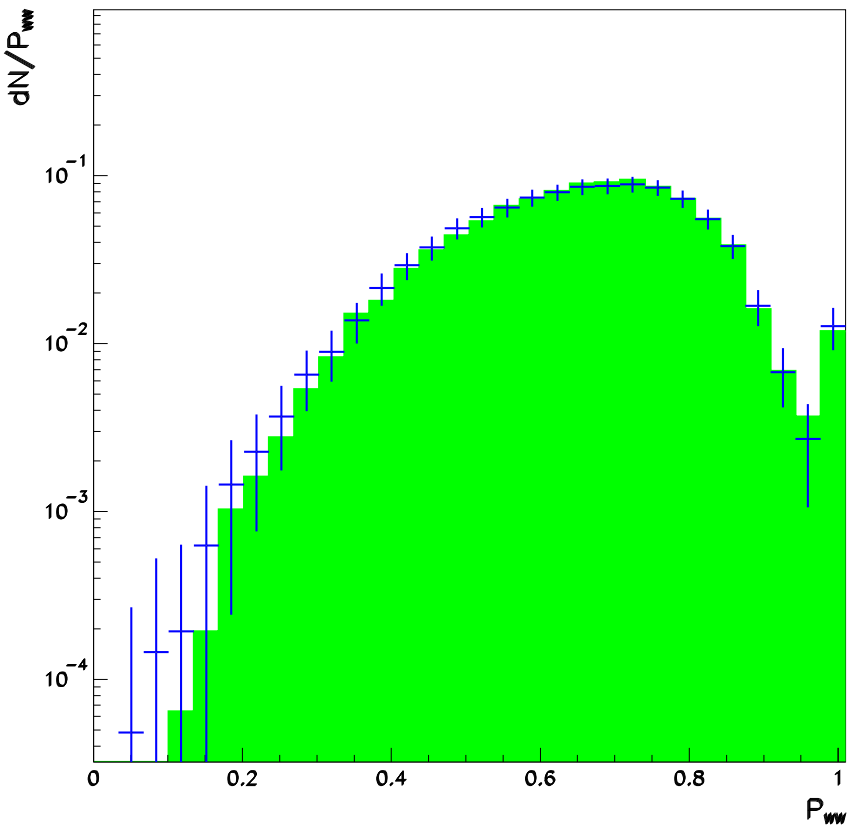
- Energy dependence
- Colour reconnection

Eff. estimation

Merged Z^0 events used:

- tracks boosted to $s = 189GeV$.
- angular dist. combined to correspond SM.
- '98 Z^0 data and MC merged.
- Check of frag. and det. effects

Distribution of events according to P_{WW} separator.



Conclusion

Results:

method	Δg_z	λ_γ	$\Delta\kappa_\gamma$
distribution	-0.04 $^{+0.31}_{-0.22}$	-0.07 $^{+0.34}_{-0.24}$	0.07 $^{+1.95}_{-0.64}$
σ	[-0.31,0.36]	[-0.31,0.42]	[-0.41,1.29]
combined	-0.05 $^{+0.30}_{-0.18}$	-0.07 $^{+0.34}_{-0.18}$	-0.04 $^{+1.25}_{-0.32}$

Stat. error scales in accordance with 183 data errors.

With systematics:

$$\Delta g_Z^1 = -0.05\,^{+0.30}_{-0.18} \pm 0.13 \quad (1)$$

$$\Delta\lambda_\gamma = -0.07\,^{+0.34}_{-0.18} \pm 0.15 \quad (2)$$

$$\Delta\kappa_\gamma = -0.04\,^{+1.25}_{-0.32} \pm 0.38 \quad (3)$$