

Single W production (leptonic channel) and TGC's at 189 GeV

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Motivation: Anomalous TGC's

Generalized (C, P invariant) Lagrangian:

$$\frac{i}{g^{WWV}} \mathcal{L}_{\text{eff}}^{WWV} = g_1^V (W_{\mu\nu}^\dagger W^\mu V^\nu - W_\mu^\dagger V_\nu W^{\mu\nu}) + \\ + \kappa_V W_\mu^\dagger W_\nu V^{\mu\nu} + \frac{\lambda_V}{m_W^2} W_{\rho\nu}^\dagger W_\nu^\mu V^{\rho\nu}$$

$$g^{WW\gamma} = e, \quad g^{WWZ} = e \cot \theta_W$$

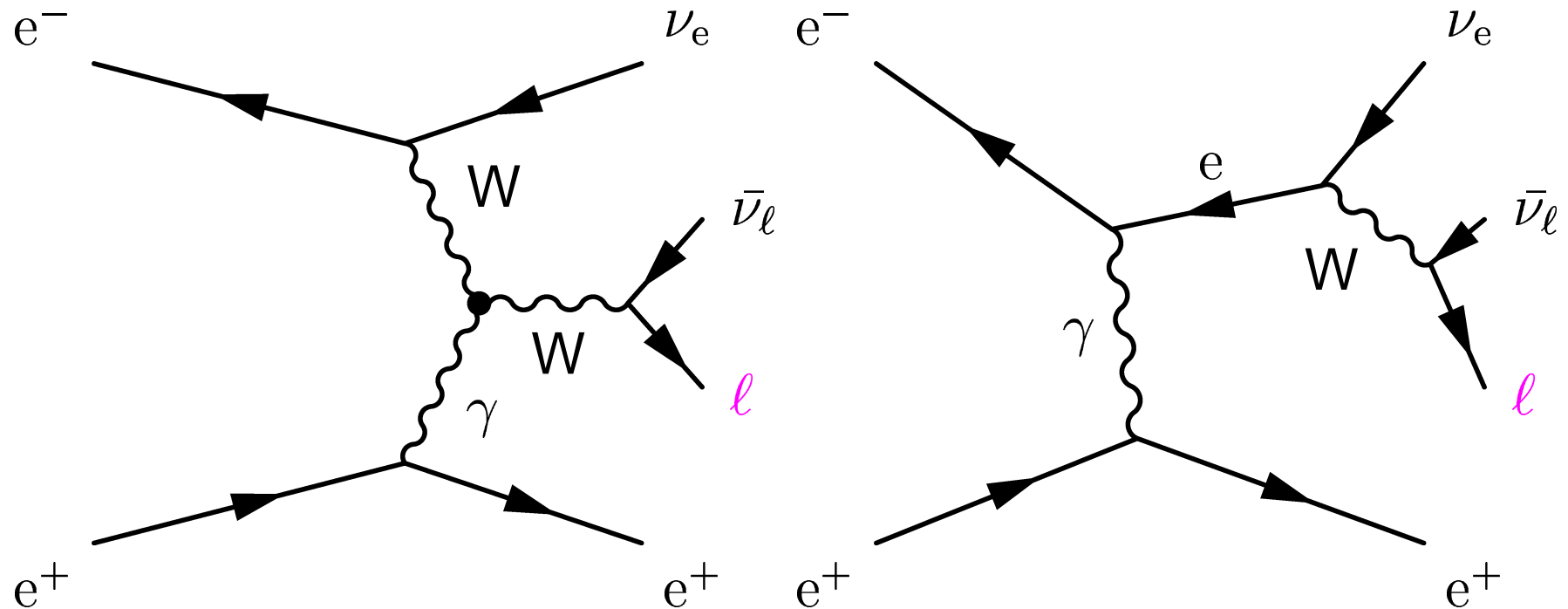
Assume only $WW\gamma$ coupling, and set $g_1^Z = 0$ fixed:

$$\frac{i}{e} \mathcal{L}_{\text{eff}}^{WW\gamma} = \kappa_\gamma W_\mu^\dagger W_\nu V^{\mu\nu} + \frac{\lambda_\gamma}{m_W^2} W_{\rho\nu}^\dagger W_\nu^\mu V^{\rho\nu}$$

$$\mathcal{SM}: \Delta\kappa_\gamma = 1 - \kappa_\gamma = 0, \quad \lambda_\gamma = 0$$

Single W production

Main contribution from



where $\ell = e, \mu$ or τ ($\approx 10 - 10\%$)

Signal definition at LEP

Only **one** high energy lepton from the W decay, no other significant activity in the detector

Kinematical cuts in the signal definition:

- >20 GeV energy of the visible lepton
- $|\cos \Theta_e| < 0.95$

Main background sources:

- 4 fermions with leptonic final states
- $\ell^+ \ell^-$ pair production
- 2 photon reactions
- $\nu \bar{\nu} \gamma$ with converted photon

The following MC's were used:

signal	grc4f
4 f Bhabha e^+e^- $\mu^+\mu^-$, $\tau^+\tau^-$ $\nu\bar{\nu}(\gamma)$ $q\bar{q}$ $\gamma\gamma \rightarrow$ hadrons $\gamma\gamma \rightarrow e^+e^-$ $\gamma\gamma \rightarrow \mu^+\mu^-$, $\tau^+\tau^-$ $\gamma\gamma(\gamma)$	grc4f BHWIDE + TEEGG KK2f nunugpv KK2f + PYTHIA PHOJET + HERWIG Vermaseren BDK RADCOR

Re-implement cuts of PN427 with changes of A. Macchiolo
(June 2000 Opal Week)

Additional cut at preselection level:
all tracks must be in a 35° cone (τ -decay)

Selection results

	μ	e	τ
4 f	6.7 ± 0.5	14.2 ± 0.7	9.3 ± 0.6
2 f	0.12 ± 0.5	0.02 ± 0.01	1.1 ± 0.2
$\gamma\gamma$	0.52 ± 0.3	0	0.17 ± 0.1
$\nu\bar{\nu}$	0	0.07 ± 0.05	0
\sum_{MC}	7.3 ± 0.8	14.3 ± 0.7	10.6 ± 0.6
MC signal	5.4 ± 0.2	9.4 ± 0.2	6.6 ± 0.2
Data	7	11	6
ε_{sel} (%)	32 ± 3	61 ± 3	43 ± 3
bg contamination (%)	74 ± 8	66 ± 3	62 ± 4

Error shown: only from MC statistics

TGC extraction

Binned Maximum Likelihood fit to

- the total event number,
- event numbers in each leptonic channel,
- E_{lepton} vs. $|\cos \Theta|$ bidimensional distribution: 5–5 bin
(0...200 GeV, 0...1)

Poisson distribution is assumed.

Method: MC sample reweighting with REW99

TGC results

	$\Delta\kappa_\gamma$	λ_γ
\mathcal{SM}	0	0
total event number		
1D	$-0.95^{+0.73}_{-0.73}$	$-0.10^{+0.70}_{-0.70}$
2D	$-0.95^{+0.73}_{-0.73}$	$-0.12^{+0.96}_{-0.96}$
family dep.		
1D	$-0.73^{+0.62}_{-0.94}$	$-0.09^{+0.72}_{-0.72}$
2D	$-0.73^{+0.62}_{-0.94}$	$0.02^{+0.96}_{-1.15}$
E vs. $ \cos \Theta $		
1D	$0.38^{+0.22}_{-0.36}$	$-0.39^{+0.30}_{-0.19}$
2D	?	?

TO DO

- calculate systematical errors
- trigger efficiencies using dilepton samples
- calculate σ
- possibly use other MC generators (WPHACT ?)
- extend to higher energies
- write diploma thesis. . .