

EXTRACTION OF TRIPLE GAUGE COUPLINGS (TGC'S)

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Fourteen independent couplings, 7 each for ZWW and γWW , completely describe the VWW vertices within the most general framework of the electroweak Standard Model (SM) consistent with Lorentz invariance and U(1) gauge invariance. Of each of the 7 TGC's, 3 conserve C and P individually, 3 violate CP , and one TGC violates C and P individually while conserving CP . Assumption of C and P conservation and electromagnetic gauge invariance reduces the independent VWW couplings to five: one common set [1,2] is $(\kappa_\gamma, \kappa_Z, \lambda_\gamma, \lambda_Z, g_1^Z)$, where $\kappa_\gamma = \kappa_Z = g_1^Z = 1$ and $\lambda_\gamma = \lambda_Z = 0$ in the Standard Model at the tree level. The parameters κ_Z and λ_Z are related to the other three due to constraints of gauge invariance as follows: $\kappa_Z = g_1^Z - (\kappa_\gamma - 1) \tan^2 \theta_W$ and $\lambda_Z = \lambda_\gamma$, where θ_W is the weak mixing angle. The W magnetic dipole moment, μ_W , and the W electric quadrupole moment, q_W , are expressed as $\mu_W = e (1 + \kappa_\gamma + \lambda_\gamma)/2M_W$ and $q_W = -e (\kappa_\gamma - \lambda_\gamma)/M_W^2$.

Precision measurements of suitable observables at LEP1 has already led to an exploration of much of the TGC parameter space. At LEP2 the VWW coupling arises in W -pair production via s -channel exchange or in single W production via the radiation of a virtual photon off the incident e^+ or e^- . At the TEVATRON hard photon bremsstrahlung off a produced W or Z signals the presence of a triple gauge vertex. In order to extract the value of one TGC the others are generally kept fixed to their SM values.

References

1. K. Hagiwara *et al.*, Nucl. Phys. **B282**, 253 (1987).
2. G. Gounaris *et al.*, CERN 96-01 p. 525.