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Precision measurement of Triple Gauge Couplings at future electron-positron colliders

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Abstract: With the lack of hints of new physics at high energies the focus of particle physics has started turning to precision measurements to detect small deviations from the expectations of the Standard Model. Complementary to the HL-LHC, a future electron-positron collider with energies at the electroweak symmetry breaking (EWSB) scale could enable such precise tests in the Higgs-, Electroweak- and top-sectors. Multiple proposals for such a collider are currently under discussion. Their designs vary most prominently in the center-of-mass energy, the luminosity at those energies and the availability of polarisation of either beam. The influence of these quantities on the precision of measurements informs which characteristics are desirable in a future collider. In the projection of sensitivities of electron-positron colliders, the contact interaction of three gauge bosons takes an important role. Anomalies in the triple gauge boson couplings (TGCs) could hint towards new physics in the gauge boson sector. In addition, the measured TGCs enter into signal and background estimations of Higgs coupling measurements and must be strongly constrained. Possible anomalous deviations in the TGCs can be quantified in a generic way using an effective field theory (EFT) approach. Fitting anomalous TGCs to data requires the use of final state measurements which are also used to determine beam polarisation and chiral cross-sections. Due to this overlap, a parallel fit of all these parameters is required. Such a fit has been set up and uses multi-dimensional differential cross-sections to fit TGC, chiral cross-section, and polarisation parameters. Results of this fit are presented for different setups of possible electron-positron colliders at the EWSB-scale energies, with a focus on the influence of polarisations and luminosity.

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