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Chiral U(1) model and restoration of symmetry at the 2-loop level

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Dimensional Regularization is one of the most commonly employed schemes for practical calculations in perturbative quantum field theories. In this scheme, however, the γ_5 Dirac matrix needs to remain purely 4-dimensional in order to be able to describe theories with chiral anomalies, which are necessary due to the fact that the existence of chiral fermions is a fundamental fact of nature. It is possible either to introduce inconsistencies or to keep the mathematical rigor with Breitenlohner -Maison -'t-Hooft - Veltman scheme, with the consequence of breaking gauge and BRST symmetry. However, it is possible to restore symmetries with a choice of proper local counterterms, which will be shown in the U(1) example up to the two-loop level.

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