

UV Completion of Neutral Triple Gauge Couplings

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Neutral triple gauge couplings (nTGCs) are manifestation of new physics beyond the Standard Model (SM), as they are absent in the SM and are first generated by dimension-8 operators in the SM Effective Field Theory (SMEFT). We study the UV completion of nTGCs in a renormalizable model with vector-like heavy fermions. We compute the one-loop heavy fermion contributions to nTGC vertices by matching them to dimension-8 operators in the low energy limit. Such fermion loops contain either heavy fermions only or mixture of heavy fermions with light SM fermions. We find that their contributions can induce dimension-8 nTGC effective operators containing two SM Higgs-doublet fields, which are formulated with a complete set of 7 dimension-8 operators generating off-shell CP-even nTGCs. We present the results in terms of SMEFT coefficients and in terms of nTGC vertices (form factors) with two on-shell gauge bosons. In the heavy-light mixing case there appear terms that cannot be accommodated by conventional parametrizations of form factors due to extra logarithmic corrections. We further discuss the implications for probing such UV dynamics via nTGCs at the high energy colliders.

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