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Constraints on four-light quark operators in the SMEFT

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Among the dimension-six operators in the Standard Model Effective Field Theory (SMEFT), the four-light quark (4LQ) ones introduce four-fermion contact interactions that are not present in the Standard Model (SM), featuring the (anti-) quarks that are lighter than the top one. At Leading Order (LO), they do not contribute to the main Higgs and top processes, so they are almost never included in global fits. They can, though, induce corrections to virtually any process at Next-to-Leading Order (NLO), if two of the fermionic lines in the diagrams they introduce are closed into a loop. In our study, we aim to get better constraints on them by checking their contributions to dijet production and Vector Boson Fusion (VBF) processes where a photon, a Z or a W boson are generated together with jets. We include the interference with the SM for ten operators in this study, with different colour and helicity structures: $O_{qq}^{(1)}$, $O_{qq}^{(3)}$, O_{uu}, O_{dd}, $O_{ud}^{(1)}$, $O_{ud}^{(8)}$, $O_{qu}^{(1)}$, $O_{qu}^{(8)}$, $O_{qd}^{(1)}$, $O_{qd}^{(8)}$. For each process and phase space region, we investigate which directions in the coefficient space can be constrained through the comparison with experimental data, and which flat ones can be lifted with the inclusion of higher-order corrections. The most recent developments in b- and c-jet tagging are also exploited to boost the sensitivity to some subprocesses. This work is still in progress and yet to be published.

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