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Vector-like quark doublets, weak-basis invariants and CP violation

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Even though a fourth chiral generation of fermions is experimentally ruled out, the possibility of extending the SM with vector-like quarks (VLQs), where both chiral components transform the same way under SU(2)_L cannot be excluded. In particular, extensions of the SM involving isodoublet vector-like quarks with standard charges currently stand as the favoured candidate in explaining the Cabibbo Angle Anomalies. This stems primarily from the fact that they allow for both left-handed and right-handed charged currents. This feature of isodoublet VLQ models not only gives rise to a very rich phenomenology, but may also induce important new sources of CP violation. In turn, these sources are directly connected to the existence of additional CP-odd weak basis invariant (WBI) quantities, distinct from the single one present in the SM or those present in other VLQ models. In this talk we present these new WBI quantities and show how they may signal the presence of CP violation at extremely high energies. Moreover, we relate the structure and mass dimension of these WBIs to various types of effective rephasing invariant quantities arising from the interplay of LH and RH charged currents, thus inducing imprints on a variety of flavor observables that are unique to VLQ isodoublet extensions.

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