

# Extending the SM with vector-like quarks: consequences for CKM unitarity and CP violation

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Although, a fourth chiral generation of fermions is excluded by experimental data, the possibility of extending the SM with vector-like quarks, where both chiral components transform the same way under  $SU(2)_L$ , has not been ruled out. In fact, these fields are present in a great variety of NP models, from GUTs to solutions to the strong CP problem.

Moreover, introducing VLQs leads to the loss of CKM unitarity making them some of the simplest solutions to the Cabibbo Angle Anomaly (CAA). However, this in turn leads to the emergence of flavour changing neutral currents at tree-level and other phenomenological effects. Additionally, their introduction leads to extended mass matrices with a larger content of physical phases and thus new sources of CP violation, which could have important implications for baryogenesis.

Here we explore the main phenomenological effects of adding VLQs, in particular in the context of addressing the CAA; discuss how one may construct weak basis invariants for the extended theory and present some of the most important CP-odd invariants, which may point to potentially observable CP violation even at collisions with energies much higher than the EW scale.

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