

Generating the Weak Scale by Vector-like Quark Condensation

In this work we discuss that vector-like quarks in the fundamental or higher-dimensional representation of QCD generally break chiral symmetry by dynamically generated condensates. The numerical solution of the Dyson-Schwinger equation shows that this can generate considerable scales, because the vacuum expectation value of the condensate increases with the hard vector-like mass. Transferring such a scale to the Standard Model by a conformally invariant scalar sector can dynamically generate the electroweak scale without a naturalness problem, since the hard vector-like fermion masses are protected by chiral symmetry. We present a minimal setup which requires a new scalar singlet with sub-TeV mass, as well as a VL quark at the (multi-)TeV scale, both of which are attractive targets for experimental searches at the LHC and future colliders.

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