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Threshold Corrections and An Optimal SU(5)

The SU(5) grand unified model, unifying standard model quarks and leptons into $\overline{5}$ and 10-dimensional representations, and incorporating only a five-dimensional representation Higgs in the Yukawa sector, yields the observationally inconsistent relation $Y_d = Y_e^T$. We demonstrate that this equality can be modified by introducing quantum corrections in the presence of one or more gauge singlet fermions. One-loop threshold corrections, originating from heavy leptoquark scalar and vector bosons present in the model, along with heavy singlet fermions, can generate realistic fermion mass spectrum including leptonic spectrum, provided their masses differ by atleast two orders of magnitude. Importantly, our findings highlight the feasibility of the simplest Yukawa sector when accounting for quantum corrections and substantial threshold effects.

Field of contribution

Phenomenology

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