

Flavor structure in $SO(10)$ SUSY GUT from effective operators

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We investigate the Yukawa sector of $SO(10)$ Grand Unified Theories by using the real representations 45 and 210 of $SO(10)$ to construct a class of effective non-renormalizable $SO(10)$ operators of the form $16 \times 16 \times 10 \times 45^n \times 210^m$. The representations 45 and 210 acquire 2 and 3 independent VEV components, respectively. Assuming the overall VEVs of the 45 and 210 take well-defined directions with respect to the Pati-Salam or $SU(5) \times U(1)$ subgroups, one can obtain fermion mass ratio predictions at the GUT scale other than those from flavor models in $SU(5)$ GUTs. Furthermore, we also investigate cases where the breaking sector of the model allows VEVs to align in arbitrary directions. In particular, we study in detail a scenario where we assume single operator dominance for the 22 and 33 Yukawa entries (operators with powers of 45 only). Requiring then for masses of the 3rd and 2nd family, which are run via RGE to low energies, to be consistent with their experimentally measured values, the model yields predictions for the size of threshold corrections at the SUSY scale, and thus constrains the MSSM spectrum.

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