

Fermion masses and mixing within a SU(3) family symmetry model with five sterile neutrinos

Albino Hernandez-Galeana

Abstract: Within a broken local vector-like SU(3) family symmetry, we address the problem of quark masses and mixing in a framework with five sterile neutrinos.

Heavy fermions, top and bottom quarks and tau lepton become massive at tree level from See-saw mechanisms implemented by the introduction of a new set of SU(2)_L weak singlets vector-like fermions U,D,E,N, with N a neutral lepton. The fermion content also include three right handed neutrinos introduced to cancel anomalies. Therefore, in this scenario light quarks and leptons, including active neutrinos and a light O(eV) sterile neutrino, become massive from radiative loop corrections mediated by the massive SU(3) gauge bosons.

We provide a parameter space region where this framework can accommodate the known hierarchical spectrum of quark masses and mixing, the charged lepton masses and simultaneously suppress properly the current experimental constraints on $K_0 - \bar{K}_0$ and $D_0 - \bar{D}_0$ meson mixing.

We also report the non-unitary, (VCKM)_{4×4} and (UPMNS)_{4×8}, quark and lepton mixing matrices.

In addition, we find out that the mass of the SU(2)_L weak singlet vector-like D quark introduced in this scenario may lie within a few TeV's region, and hence within current LHC possibilities.

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