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Yukawaon Model and Unified Description of Quark and Lepton Mass Matrices

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In the so-called "yukawaon" model, where the effective Yukawa coupling constants Y_f^{eff} ($f = e, \nu, u, d$) are given by vacuum expectation values (VEVs) of gauge singlet scalars (yukawaons) Y_f with 3×3 flavor components, i.e. $Y_f^{eff} = (y_f/\Lambda)\langle Y_f \rangle$ (Λ is an energy scale of an effective theory), it is tried to give a unified description of quark and lepton mass matrices. VEV structures of the yukawaons are obtained from SUSY vacuum conditions for a superpotential. As a result, we obtain we obtain the following quark mass matrices M_u and M_d and neutrino mass matrix M_ν: $M_u^{1/2} = c_u M_e^{1/2}(X + a_u \mathbf{1}) M_e^{1/2}$, $M_d = c_d M_e^{1/2}(X + a_d \mathbf{1}) M_e^{1/2}$ and $M_\nu = c_\nu \left(M_e^{-1} M_u^{1/2} + M_u^{1/2} M_e^{-1} + \ xi i_0 \mathbf{1} \right)^{-1}$, respectively, where X is a democratic matrix. We can obtain reasonable values not only for quark mass ratios but also for quark mixing matrix (CKM matrix) with few parameters $a_u \simeq -0.58$ and $a_d \simeq -0.63 e^{i 2^\circ}$. Besides, the model can give reasonable neutrino mixings. (Refs:Y.Koide, arXiv:0904.1644; Phys.~Lett. {\bf B665}, 227 (2008).

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