

Hidden sector behind the quark mixing

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The small quark mixing, described by the Cabibbo-Kobayashi-Maskawa (CKM) matrix in the Standard Model, may be a clue to reveal new physics around the TeV scale. We consider a simple scenario that extra particles in a hidden sector radiatively mediate the flavor violation to the quark sector around the TeV scale and effectively realize the observed CKM matrix. The lightest particle in the hidden sector, whose contribution to the CKM matrix is expected to be dominant, is a good dark matter (DM) candidate, so we focus on the contribution, and discuss the DM physics. In this scenario, there is an explicit relation between the CKM matrix and flavor violating couplings, such as four-quark couplings, because both are radiatively induced by the particles in the hidden sector. Then, we can explicitly find the DM mass region and the size of Yukawa couplings between the DM and quarks, based on the study of flavor physics and DM physics. In conclusion, we show that DM mass in our scenario is around the TeV scale, and the Yukawa couplings are between $O(0.01)$ and $O(1)$. The spin-independent DM scattering cross section is estimated as $O(10^{-9})$ [pb]. We also introduce the light dark matter scenario.

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