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FCNC Effects in a Minimal Theory of Fermion Masses

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As a minimal theory of fermion masses we extend the SM by heavy vectorlike fermions that mix with chiral fermions, such that small SM Yukawa couplings arise from small mixing angles. This model can be regarded as an effective description of the fermionic sector of a large class of existing flavor models and thus might serve as a useful reference frame for a further understanding of flavor hierarchies in the SM. Already such a minimal framework gives rise to FCNC effects through exchange of massive SM gauge bosons whose couplings to the light fermions get modified by the mixing. We derive general formulae for these corrections and discuss the bounds on the heavy fermion masses, finding that such fermions can still be as light as a TeV and therefore in the reach of the LHC. We discuss the connection of the minimal model to existing flavor models and consider additional structures that could be imposed in the heavy fermionic sector.

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