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Linking LFV Higgs decays $h \to l_i l_j$ with CP violation in multi-scalar models

The study of LFV decays of the Higgs boson, $h \to \ell_i \ell_j$, has become an active research subject both from the experimental and theoretical points of view. Such decays vanish within the SM and are highly suppressed in several theoretical extensions. Due to its relevance and relative simplicity to reconstruct the signal at future colliders, it is an important tool to probe SM extensions where it could reach detectable levels. Here we identify a mechanism that allows to induce large LFV Higgs interactions, by linking it with the appearance of CP violation in the scalar flavon sector, within the context of general multi-Higgs models. We then focus on the simplest model of this type to study its phenomenology, whose scalar sector consists of a Higgs doublet and a Froggatt–Nielsen (FN) (complex) singlet. Constraints on the parameters of the model are derived from low-energy observables and LHC Higgs data, which are then applied to predicted the rate for the decay $h \to \tau\mu$. Overall, branching ratios for $h \to \tau\mu$ of the order 10^{-3} are obtained within this approach, that are consistent with all known constraints.

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