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Muon flavor violation and EDM in light of muon g-2

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Recent developments in the muon $g-2$ anomaly may bring about a renaissance of μ (and τ) physics. The anomaly can be accounted for in the general two Higgs doublet model (without *ad hoc* Z_2 symmetry) via one-loop exchange of nondegenerate scalar H and pseudoscalar A bosons that have flavor changing neutral Yukawa couplings $\rho_{\tau\mu}$ and $\rho_{\mu\tau}$ at $\sim 20\lambda_\tau$, i.e. 20 times the usual τ Yukawa coupling. The complexity of $\rho_{\tau\mu}\rho_{\mu\tau}$ leads to rather large μEDM that can be detected by the PSI program. A similar diagram with $\rho_{\tau e} \simeq \rho_{e\tau} = calO(\lambda_e)$ induces $\mu \to e\gamma$, right into the sensitivity range of MEG II. The $\mu e\gamma$ dipole can be further probed by $\mu \to 3e$ and $\mu N \to eN$, where the latter may access extra diagonal quark Yukawa couplings ρ_{qq}. For the τ lepton, $\tau \to \mu\gamma$ can probe $\rho_{\tau\tau}$ down to λ_τ or lower, while $\tau \to 3\mu$ can probe $\rho_{\mu\mu}$ down to $calO(\lambda_\mu)$. The absence of $h(125) \to \tau\mu$ implies the h-H mixing angle c_γ has to be close to vanishing. While seemingly artificial, it may call for a symmetry behind the emergent "alignment" ($c_\gamma \to 0$) phenomenon. If $\rho_{\tau\mu}$ and $\rho_{\mu\tau}$ are at the more *natural* $calO(\lambda_\tau)$ so the one-loop mechanism is not behind the muon g-2 anomaly, μ and τ flavor violation remain interesting, but become a bit less rosy.

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