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Power-aligned 2HDM: a correlative perspective on $(g-2)_{e,\mu}$

With the hypothesis of minimal flavor violation, we find that there exists a power-aligned relation between the Yukawa couplings of the two scalar doublets in the two-Higgs-doublet model with Hermitian Yukawa matrices. Within such a power-aligned framework, it is found that a simultaneous explanation of the anomalies observed in the electron and muon anomalous magnetic moments can be reached with TeV-scale quasi-degenerate Higgs masses, and the resulting parameter space is also phenomenologically safer under the B-physics, Z and τ decay data, as well as the current LHC bounds. Furthermore, the flavor-universal power that enhances the charged-lepton Yukawa couplings prompts an interesting correlation between the two anomalies, which makes the model distinguishable from the (generalized) linearly aligned and the lepton-specific two-Higgs-doublet models that address the same anomalies but in a non-correlative manner, and hence testable by future precise measurements.

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