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Closing in on new chiral leptons at the LHC

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We study the phenomenological viability of chiral extensions of the Standard Model, with new chiral fermions acquiring their mass through interactions with a single Higgs. We examine constraints from electroweak precision tests, Higgs physics and direct searches at the LHC. Our analysis indicates that purely chiral scenarios are perturbatively excluded by the combination of Higgs coupling measurements and LHC direct searches. However, allowing for a partial contribution from vector-like masses opens up the parameter space and non-decoupled exotic leptons could account for the observed 2σ deviation in $h \rightarrow Z\gamma$. This scenario will be further tested in the high-luminosity phase of the LHC.

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