

Accumulating Evidence for New Higgs Bosons at the LHC

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Statistically significant excesses exist at around 152 GeV in associated di-photon production contained in the sidebands of SM Higgs analyses. They are most pronounced in the $\gamma\gamma + \tau$, $\gamma\gamma + \text{MET}$, $\gamma\gamma + \geq 1\ell + \geq 1b$, $\gamma\gamma + 4j$ signal regions, and can be explained by the Drell-Yan production of new Higgs bosons, i.e. $pp \rightarrow W \rightarrow H^\pm$. In this context, we first examine the excesses in a simplified model approach, considering the decays of $H^\pm \rightarrow \tau\nu, tb, WZ$. We then specialize our analysis for the real Higgs triplet and two-Higgs doublet models, resulting in a combined significance of $\approx 4\sigma$ and $\approx 4.3\sigma$, respectively.

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