

A 96 GeV Higgs Boson in the N2HDM

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We discuss a $\sim 3\sigma$ signal (local) in the light Higgs-boson search in the diphoton decay mode at ~ 96 GeV as reported by CMS, together with a $\sim 2\sigma$ excess (local) in the $b\bar{b}$ final state at LEP in the same mass range. We interpret this possible signal as a Higgs boson in the 2 Higgs Doublet Model with an additional real Higgs singlet (N2HDM). We find that the lightest Higgs boson of the N2HDM can perfectly fit both excesses simultaneously, while the second lightest state is in full agreement with the Higgs-boson measurements at 125 GeV, and the full Higgs-boson sector is in agreement with all Higgs exclusion bounds from LEP, the Tevatron and the LHC as well as other theoretical and experimental constraints. We show that only the N2HDM type II and IV can fit both the LEP excess and the CMS excess with a large ggF production component at ~ 96 GeV. We derive bounds on the N2HDM Higgs sector from a fit to both excesses and describe how this signal can be further analyzed at the LHC and at future e^+e^- colliders, such as the ILC.

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