

Higgs boson precision analysis of the full LHC run 1 and run 2 data

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We perform global fits of the Higgs boson couplings to the full Higgs datasets collected at the LHC with the integrated luminosities per experiment of approximately 5/fb at 7 TeV, 20/fb at 8 TeV, and up to 139/fb at 13 TeV. Our combined analysis based on the experimental signal strengths used in this work and the theoretical ones elaborated for our analysis reliably reproduce the results in the literature. We reveal that the LHC Higgs precision data are no longer best described by the Standard Model (SM) Higgs boson taking account of extensive and comprehensive CP-conserving and CP-violating scenarios found in several well-motivated models beyond the SM. Especially, in most of the fits considered in this work, we observe that the best-fitted values of the normalized Yukawa couplings are about 2σ below the corresponding SM ones with the 1σ errors of 3%–5%. On the other hand, the gauge-Higgs couplings are consistent with the SM with the 1σ errors of 2%–3%. Incidentally, the reduced Yukawa couplings help to explain the excess of the $H \rightarrow Z\gamma$ signal strength of 2.2 ± 0.7 recently reported by the ATLAS and CMS collaborations.

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