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Lifetime and quantum numbers of the Higgs boson using the decay $H \rightarrow 4\ell$

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Constraints on the lifetime and quantum numbers of the recently discovered Higgs boson are obtained from $H \rightarrow 4\ell$ events using the full dataset recorded by the CMS experiment during the LHC Run1. The measurement of the Higgs boson lifetime is derived from limits set on its flight distance within the CMS detector and a limit of the total width obtained from an off-shell production technique. The width from off-shell production is also generalized to include additional anomalous couplings of the Higgs boson to two electroweak bosons. Using the events on the resonance peak, a wide range of spin-two and any mixed-parity spin-one models are excluded at a 99% confidence level or higher. Under the hypothesis that the resonance is a spin-zero boson, the tensor structure of the interactions of the Higgs boson with two vector bosons ZZ , $Z\gamma$, and $\gamma\gamma$ are investigated and limits on nine anomalous contributions are set. All observations are consistent with the expectations for the 125 GeV standard model Higgs boson with quantum numbers $J^{PC} = 0^{++}$ and a width of about 4 MeV.

Oral or Poster Presentation

Oral

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