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SM Higgs searches by CMS at the LHC

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Results are presented from searches for the standard model (SM) Higgs boson in proton-proton collisions at $\sqrt{s} = 7$ and 8 TeV in five decay modes: $gamma\gamma$, bb, $\tau\tau$, WW, and ZZ. The analysed data correspond to integrated luminosities of up to 5.1 1/fb at 7 TeV and 5.3 1/fb at 8 TeV. The data exclude the existence of a SM Higgs boson in the ranges 110–122.5 and 127–600 GeV at 95\%˜confidence level. An excess of events above the expected SM background is observed with a local significance of 4.9σ around 125 GeV, which we attribute to the production of a previously unobserved particle. The evidence is strongest in the two final states with the best mass resolution: the two-photon final state and the final state with two pairs of charged leptons (electrons or muons). The combined excess in these channels alone gives a local significance of 5.0σ. An unconstrained fit to the excesses in these two final states yields a mass of $125.3 \pm 0.4\,(\mathrm{stat}) \pm 0.5\,(\mathrm{syst})$ GeV. Within the statistical uncertainties, the results obtained in all search channels are consistent with the expectations for a SM Higgs boson.

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