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Searching for light Higgs bosons in the 2HDM at the LHC

In the framework of the Two Higgs Doublet Model (2HDM), we investigate the scope of the LHC in accessing the processes $H \to hh \to 2b2\tau, 2b2\gamma$ and $pp \to Z^* \to hA \to 4\tau$ by performing a Monte Carlo (MC) analysis aimed at extracting these signals from the Standard Model (SM) backgrounds, in the presence of a dedicated trigger choice and kinematical selection. We prove that some sensitivity to such channels exists already at Run 3 of the LHC while the High-Luminosity LHC (HL-LHC) will be able to either confirm or disprove these theoretical scenarios over sizable regions of the 2HDM parameter space.

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