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Higgs to light jets

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We study the Higgs boson (h) decay to two light jets at the 14 TeV High-Luminosity-LHC (HL-LHC), where a light jet (j) represents any non-flavor tagged jet from the observational point of view. The decay mode $h \rightarrow gg$ is chosen as the benchmark since it is the dominant channel in the Standard Model (SM), but the bound obtained is also applicable to the light quarks ($j=u,d,s$). We estimate the achievable bounds on the decay branching fractions through the associated production Vh ($V=W^\pm, Z$). Events of the Higgs boson decaying into heavy (tagged) or light (un-tagged) jets are correlatively analyzed. We find that with 3000 fb^{-1} data at the HL-LHC, we should expect approximately 1σ statistical significance on the SM $Vh(gg)$ signal in this channel. This corresponds to a reachable upper bound $\text{BR}(h \rightarrow jj) \leq 4 \text{ BR}_{\text{SM}}(h \rightarrow gg)$ at 95% confidence level. A consistency fit also leads to an upper bound $\text{BR}(h \rightarrow cc) < 15 \text{ BR}_{\text{SM}}(h \rightarrow cc)$ at 95% confidence level. The estimated bound may be further strengthened by adopting multiple variable analyses, or adding other production channels.

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