Contribution ID: **16** Type: **not specified**

Probing light quark Yukawa couplings through angularity distributions in Higgs boson decay

Thursday 18 March 2021 06:20 (20 minutes)

We propose to utilize angularity distributions in Higgs boson decay to probe light quark Yukawa couplings at e^+e^- colliders. Angularities τ_a are a class of 2-jet event shapes with variable and tunable sensitivity to the distribution of radiation in hadronic jets in the final state. Using soft-collinear effective theory (SCET), we present a prediction of angularity distributions from Higgs decaying to quark and gluon states at e^+e^- colliders to $\mathrm{NNLL} + \mathcal{O}(\alpha_s)$ accuracy. Due to the different color structures in quark and gluon jets, the angularity distributions from $H \to q\bar{q}$ and $H \to gg$ show different behaviors and can be used to constrain the light quark Yukawa couplings.
We show that the upper limit of light quark Yukawa couplings could be probed up to $15 \sim 22\%$ level of the bottom quark Yukawa coupling in the Standard Model.

Time Zone

Americas

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Session Classification: PD1: Theoretical Developments

Track Classification: Physics and Detectors Tracks: PD1: Theoretical Developments