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Resolving charm and bottom quark masses in precision Higgs boson analyses

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Masses of the charm and bottom quarks are important inputs to precision calculations of Higgs boson observables, such as its partial widths and branching fractions. They constitute a major source of theory uncertainties that needs to be better understood and reduced in light of future high-precision measurements. Conventionally, Higgs boson observables are calculated in terms of m_c and m_b, whose values are obtained by averaging over many extractions from low-energy data. This approach may ultimately be unsatisfactory, since m_c and m_b as single numbers hide various sources of uncertainties involved in their extractions some of which call for more careful estimations, and also hide correlations with additional inputs such as α_s. Aiming at a more detailed understanding of the uncertainties from m_c and m_b in precision Higgs boson analyses, we present a calculation of Higgs boson observables in terms of low-energy observables, which reveals concrete sources of uncertainties that challenge sub-percent-level calculations of Higgs boson partial widths.

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