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The bottom quark mass at high scale

The scale evolution of quark masses predicted by the Standard Model can be probed at collider experiments. Measurements at particle colliders can probe the scale evolution of quark masses predicted by the Standard Model in several ways. The experiments at LEP and SLD extracted $m_b(m_Z)$, that is the bottom-quark mass at the scale of the Z boson mass, with a precision of several hundred MeV from three jet rates in $Z \to b\bar{b}$ decay. The recent measurements of Higgs boson rates at the LHC allow for a first determination of $m_b(m_H)$. In this contribution, a combination of the latest ATLAS Higgs boson rates is used for the extraction of $m_b(m_H)$. The combination of low-energy measurements with $m_b(m_Z)$ and $m_b(m_H)$ yields unambiguous proof for the scale evolution of quark masses. Updated projections are provided also for the HL-LHC and future colliders, demonstrating the potential for very significant improvements in the next decades.

Abstract

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