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Determination of b -quark pole mass and \overline{MS} running mass from H1 and ZEUS beauty vertex production data

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The beauty-quark is one of the kinematically accessible heavy-quark at HERA. Measurements of open b -quark production in deep inelastic scattering (DIS) of $e^\pm p$ at HERA provide important test of perturbative Quantum Chromo Dynamics (pQCD) theory within the Standard Model and is used to constrain proton parton distribution functions (PDFs). In this contribution we attempt to determine the b -quark pole mass and \overline{MS} running mass, using H1, ZEUS and (H1 + ZEUS) $F_2^{b\bar{b}}$ beauty vertex production data sets and then we investigate the role and influence of beauty-quark mass as an extra free degree of freedom in the next-to-leading order (NLO) pQCD framework on the improvement of the uncertainty band of gluon distribution. We show the consistency of our numerical results for b -quark pole mass and \overline{MS} running mass with pQCD theory predictions are more than 99.90%, 99.95% and 99.96% corresponding to H1, ZEUS and (H1 + ZEUS) $F_2^{b\bar{b}}$ beauty vertex production data, respectively. Also, we obtain up to 0.7% improvement in the fit quality for determination of b -quark \overline{MS} running mass relative to b -quark pole mass based on (H1 + ZEUS) $F_2^{b\bar{b}}$ beauty vertex production data.

Primary author: Dr VAFAEE, Alireza (Iran's National Elites Foundation)

Co-author: Mr B. SHOKOUHI, Alireza (Shahid Beheshti University)

Presenter: Mr B. SHOKOUHI, Alireza (Shahid Beheshti University)

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