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A next-to-leading order method general-mass method for heavy-flavor production at the LHC

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We develop a systematic treatment of heavy-flavor hadroproduction in the framework of the General-Mass Variable-Flavor-Number Scheme (GM-VFNS). By following the idea of the Simplified-ACOT- χ Scheme in Deep Inelastic Scattering (DIS), we categorize the open heavy-flavor diagrams into Flavor Excitation (FE) and Flavor Creation (FC) contributions. In order to avoid double counting, overlapping contributions are subtracted using the collinear splitting approximation. The FC terms are extracted from the Fixed-Flavor-Number Scheme (FFNS), while the FE and Subtraction (SB) terms involve an initial heavy-flavor quark scattering with another parton (a light quark or gluon). We introduce a Massive Phase Space (MPS) for the FC and SB terms, which accounts for the threshold effect of massive heavy-flavor quarks. We dub this novel approach the “S-ACOT-MPS” scheme. The MPS regulates the singular behavior of the FE and SB (differential) cross sections in the limit $p_T \rightarrow 0$, and stabilizes their cancellation, thus reducing the S-ACOT-MPS scheme to the FFNS smoothly. Our numerical results demonstrate good agreement with LHCb data on B^\pm production at 7 and 13 TeV.

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