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The transverse momentum spectrum of low mass Drell-Yan production at next-to-leading order in the parton branching method

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The transverse momentum spectrum of low mass Drell-Yan (DY) production at low center-of-mass energies $\sqrt{s}$ is calculated by applying transverse momentum dependent (TMD) parton distributions obtained from the Parton Branching (PB) evolution method, combined with the next-to-leading-order (NLO) calculation of the hard process in the MCatNLO method. We compare our predictions with experimental measurements at low DY mass, and find very good agreement. In addition we use the low mass DY measurements at low $\sqrt{s}$ to determine the width q_s of the intrinsic Gauss distribution of the PB-TMDs at low evolution scales. We find values close to what has earlier been used in application of PB-TMDs to high-energy processes at the Large Hadron Collider (LHC) and HERA. We find that low DY mass and low q_s even in the region of $p_t/m_{DY} \sim 1$ the contribution of multiple soft gluon emissions (included in the PB-TMDs) is essential to describe the measurements, while at larger masses and LHC energies the contribution from soft gluons in the region of $p_t/m_{DY} \sim 1$ is small.

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