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Predictions involving intrinsic charm effects for fixed-target experiments, far-forward neutrino facilities and neutrino telescopes

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We discuss production of neutral D mesons in proton-proton collisions at the LHC fixed target mode in the framework of the BJM recombination model [1]. We present rapidity and transverse momentum distributions of D mesons and compare the recombination contribution to the dominant gluon-gluon fusion mechanism. Both the direct production, as dictated by the matrix element, and fragmentation of the associated c or $\bar{c}$ are included. The latter mechanism generates D mesons with smaller rapidities than those produced directly. We calculate the $D^0 + \overline{D}^0$ meson distributions relevant for fixed target $p+^4He$ collisions at $\sqrt{s}$ = 86.6 GeV as well as for $p+^{20}Ne$ collisions at $\sqrt{s}$ = 69 GeV. The recombination component improves the description of the LHCb data and in addition results in production asymmetry. The asymmetries in $D^0\overline{D^0}$ production as a function of rapidity and transverse momentum are shown and the cancellation of terms for direct production and associated $c/\bar{c}$ fragmentation is discussed.

We discuss also production of far-forward charm/anticharm quarks, D mesons and neutrinos/antineutrinos from their semileptonic decays in proton-proton collisions at the LHC energies [2]. The calculation is preformed within k_t-factorization and hybrid model using different unintegrated gluon distribution functions (UGDFs) from the literature. We include gluon-gluon fusion, intrinsic charm (IC) as well as recombination mechanisms. We compare our results to the LHCb data for different rapidity bins in the interval $2 < y < 4.5$. A good description is achieved for the Kimber-Martin-Ryskin UGDF. We also show results for the Kutak-Sapeta UGDF, both in the linear form and including nonlinear effects. The nonlinear effects play a role only at very small transverse
momenta of D^0 or $\bar{D}^0$ mesons. The IC and recombination models are negligible at the LHCb kinematics. Both the mechanisms start to be crucial at larger rapidities and dominate over the standard charm production mechanisms. At high energies there are so far no experiments probing this region. We present uncertainty bands for the both mechanisms. Decreased uncertainty bands will be available soon from the fixed target experiments p + A. The recombination component leads to production asymmetry for quarks ($c \neq \bar{c}$) and in consequence for mesons ($D^0 \neq \bar{D}^0$). We present also energy distributions for forward neutrinos to be measured by the forward physics facilities such as FASERν. We show results for electron, muon and tau neutrinos. Again different components are shown separately.

[1] R. Maciuła and A. Szczurek, arXiv:2206.02750 [hep-ph].
[1] R. Maciuła and A. Szczurek, a paper in preparation.

Declaration

I certify that I have checked that I am authorised to submit the abstract with the listed co-authors with their current affiliations

Change of Speaker

I understand that change of speaker is allowed provided that no participant gives more than one talk. Otherwise, we will ask the speaker to choose between one or the other abstract to be presented.

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