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## Production of forward charm and neutrinos and unintegrated gluon distributions at very small $x$

Sunday, 25 September 2022 09:25 (20 minutes)

We discuss production of forward charm/anticharm quarks,  $D$  mesons and neutrinos/antineutrinos from their semileptonic decays in proton-proton collisions at the LHC energies.

The calculation is performed 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 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 FASER $\nu$ .

We show results for electron, muon and tau neutrinos.

Again different components are shown separately.

The presentation is based on a paper in preparation [1].

[1] R. Maciula and A. Szczurek, a paper in preparation.

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**Session Classification:** Recent theoretical results on QCD and saturation

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