Contribution ID: **130** Type: **Parallel**

Far-forward production of D-mesons and neutrinos from their semileptonic decays at the LHC

Friday, 23 June 2023 15:20 (20 minutes)

We discuss production of far-forward D mesons/antimesons and neutrinos/antineutrinos from their semileptonic decays in proton-proton collisions at the LHC energies. We include the gluon-gluon fusion $gg \to c\bar{c}$, the intrinsic charm (IC) $gc \to gc$ as well as the recombination $gq \to Dc$ partonic mechanisms. The calculations are performed within the k_T-factorization approach and the hybrid model using different unintegrated parton distribution functions (uPDFs) for gluons from the literature, as well as within the collinear factorization approach. We compare our results to the LHCb data for forward D^0-meson production at $\sqrt{s} = 13$ TeV for different rapidity bins in the interval $2 < y < 4.5$. The IC and recombination model give negligible contributions 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. Somewhat reduced uncertainty bands will be available soon from fixed-target charm meson production experiments in pA-collisions. We present also energy distributions for forward electron, muon and tau neutrinos to be measured at the LHC by the currently operating FASERν experiment, as well as by future experiments like FASERν2 or FLArE, proposed very recently by the Forward Physics Facility project.

Contributions of different mechanisms are shown separately. For all kinds of neutrinos (electron, muon, tau) the subleading contributions, i.e. the IC and/or the recombination, dominate over light meson (pion, kaon) and the standard charm production contribution driven by fusion of gluons for neutrino energies $E_\nu > 300$ GeV. For electron and muon neutrinos both the mechanisms lead to a similar production rates and their separation seems rather impossible. On the other hand, for $\nu_\tau + \bar{\nu}_\tau$ neutrino flux the recombination is reduced further making the measurement of the IC contribution very attractive.

[1] R. Maciuła and A. Szczurek, "Far-forward production of charm mesons and neutrinos at forward physics facilities at the LHC and the intrinsic charm in the proton", Phys.Rev.D 107, no.3, 034002 (2023).

Collaboration

Primary authors: SZCZUREK, Antoni (Institute of Nuclear Physics PAS); MACIUŁA, Rafał (Institute of Nuclear Physics PAS)

Presenter: MACIUŁA, Rafał (Institute of Nuclear Physics PAS)

Session Classification: Parallel session A3