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A novel phenomenological approach to total charm cross section measurements at the LHC

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Measuring the total charm cross section is important for the comparison to theoretical predictions with the highest precision available today, which are completely known up to NNLO in perturbative QCD for the total inclusive charm cross sections in pp collisions, while they are only known up to NLO+NLL for differential and fiducial cross sections. All total charm cross-section measurements obtained at LHC so far are either invalidated by not yet accounting for the recent observations of the nonuniversality of charm fragmentation, or fiducially limited to the central rapidity range only, or to some other fiducial range, such that no NNLO comparison is possible.

Combining the published information from all LHC experiments on the measured charm fiducial cross sections with all available charm fragmentation nonuniversality measurements, the first measurement of the inclusive total charm cross section in pp collisions at 5 TeV that accounts for charm fragmentation nonuniversality is obtained, and compared to the corresponding NNLO QCD prediction.

In order to achieve this, the remaining nonmeasured phase space regions are interpolated or extrapolated by constraining the uncertainties of the shape of the available perturbative NLO+NLL QCD predictions in a novel data driven way including nonuniversality corrections, such that these uncertainties are considerably reduced without the need to refer to any particular nonperturbative model for charm fragmentation nonuniversality.

The size of the effect of ignoring charm fragmentation nonuniversality in previous inclusive total charm cross section evaluations is also quantified.

Collaboration / Activity

Phenomenology

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