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Modelling W boson pair production with rapidity gaps at the LHC

Wednesday 4 May 2022 11:30 (20 minutes)

In this talk we will present a new calculation of W^+W^- production in the semi–exclusive channel, that is either with intact outgoing protons or rapidity gaps present in the final state, and with no colour flow between the colliding protons. This study provides the first complete prediction of the W^+W^- semi–exclusive cross section, as well as the breakdown between elastic and proton dissociative channels. It combines the structure function calculation for a precise modelling of the region of low momentum transfers with a parton–level calculation in the region of high momentum transfers. The survival factor probability of no additional proton–proton interactions is fully accounted for, including its kinematic and process dependence. We analyse in detail the role that the pure photon–initiated ($\gamma\gamma \to W^+W^-$) subprocess plays, a comparison that is only viable by working in the electroweak axial gauge. In this way, we find that the dominance of this is not complete in the proton dissociative cases, although once Z–initiated production is included a significantly better matching to the complete calculation is achieved. A direct consequence of this is that the relative elastic, single and double dissociative fractions are in general different in comparison to the case of lepton pair production. We present a direct comparison to the recent ATLAS data on semi–exclusive W^+W^- production, finding excellent agreement within uncertainties. Our calculation is provided in the publicly available \texttt{SuperChic 4.1} Monte Carlo (MC) generator, and can be passed to a general purpose MC for showering and hadronization of the final state.

Submitted on behalf of a Collaboration?

No

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