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Improving LHC sensitivity to charged and neutral broad resonances of new gauge sectors with Drell-Yan measurements

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In scenarios beyond the Standard Model (BSM) characterised by charged (W') or neutral (Z') massive gauge bosons with large width, resonant mass searches are not very effective, so that one has to exploit the tails of the mass distributions measured at the Large Hadron Collider (LHC). In this case, the LHC sensitivity to new physics signals is influenced significantly by systematic uncertainties associated with the Parton Distribution Functions (PDF), particularly in the valence quark sector relevant for the multi-TeV mass region. As a BSM framework featuring such conditions, we consider the 4-Dimensional Composite Higgs Model (4DCHM), in which multiple W' and Z' broad resonances are present, with strongly correlated properties. By using the QCD tool xFitter, we study the implications on W' and Z' searches in Drell-Yan (DY) lepton decay channels that follow from the reduction of PDF uncertainties obtained through combining high-statistics precision measurements of DY lepton-charge and forward-backward asymmetries. We find that the sensitivity to the BSM states is greatly increased with respect to the case of base PDF sets, thereby enabling one to set more stringent limits on (or indeed discover) such new particles, both independently and in correlated searches.

In-person participation

Yes

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