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High precision Monte Carlo tools for electroweak precision measurements at hadron colliders

The precision physics programme at the LHC, particularly measurements of Standard Model parameters like the W boson mass and the weak mixing angle, rely heavily on accurate theoretical predictions. These measurements employ template-fitting methods where Monte Carlo (MC) event generators provide templates parameterized by the fundamental quantity being measured. Theoretical uncertainties are a limiting component, directly propagating to the final experimental error via the MC templates.

In this contribution, we present the latest developments of the Z_ew-BMNNPV event generator for the neutral Drell-Yan process at NLO Electroweak+NLO QCD accuracy with matching to parton showers in the POWHEG framework. We use this tool to study the impact of various electroweak theoretical uncertainties on key observables used for the weak mixing angle determination at the LHC and we investigate the role of electroweak input parameter schemes on the sensitivity to the weak mixing angle at the electroweak and multi-TeV scale.

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