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Probing the Weak Mixing Angle at high energies at the LHC

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The weak mixing angle is a probe of the vector-axial coupling structure of electroweak interactions. It has been measured precisely at the Z-pole by experiments at the LEP and SLD colliders, but its energy dependence above m_Z remains unconstrained.

In this contribution we propose to exploit measurements of Neutral-Current Drell-Yan production at the Large Hadron Collider at large invariant dilepton masses to determine the scale dependence of the weak mixing angle in the MSbar renormalisation scheme, $sin^2\theta_W(\mu)$.
Such a measurement can be used to confirm the Standard Model predictions for the MSbar running at TeV scales, and to set model-independent constraints on new states with electroweak quantum numbers.
To this end, we present an implementation of $sin^2\theta_W(\mu)$ in a Monte Carlo event generator in Powheg-Box, which we use to explore the potential of future dedicated analyses with the LHC Run3 and High-Luminosity datasets.
In particular, we study the impact of higher order electroweak corrections and of uncertainties due the knowledge of parton distribution functions.

In-person participation

Yes

Primary authors: VICINI, Alessandro (Istituto Nazionale di Fisica Nucleare); VAZZOLER, Federico (DESY CMS); AMOROSO, Simone; DEL PIO, Clara Lavinia (Istituto Nazionale di Fisica Nucleare); PICCININI, Fulvio (Istituto Nazionale di Fisica Nucleare); LIPKA, Katerina (DESY); CHIESA, Mauro (PV)

Presenter: VAZZOLER, Federico (DESY CMS)

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