

# Electroweak vector-boson production in hadronic collisions with ALICE

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Electroweak  $W$  and  $Z$  bosons, produced in hard-scattering processes at the early stage of hadronic collisions, are excellent probes of their initial state. The  $W$  and  $Z$  measurements in  $pp$  collisions represent a stringent test of perturbative QCD calculations, and provide important input for the determination of parton distribution functions (PDFs). In  $p$ -Pb and Pb-Pb collisions, these measurements can constrain the nuclear PDFs and test the binary-scaling for hard processes.

Electroweak  $W$  and  $Z$  bosons are studied with ALICE in  $pp$ ,  $p$ -Pb, and Pb-Pb collisions via their leptonic decays in the muon and electron channels at forward rapidity ( $-4.0 < \eta < -2.5$ ) and midrapidity ( $|\eta| < 0.8$ ), respectively. The measurements in  $p$ -Pb and Pb-Pb collisions at forward rapidity give access to low Bjorken- $x$  values, a phase-space region poorly constrained by other heavy-ion experiments.

A review of the  $W$ - and  $Z$ -boson results and their comparison to model calculations are presented, with particular emphasis on those recently obtained in  $pp$  collisions at midrapidity. That concerns differential measurements of the production cross sections, nuclear modification factors and lepton-charge asymmetry as a function of rapidity, transverse momentum, collision centrality and charged-particle multiplicity. The production of  $W$  bosons in association with hadrons as a function of the charged-particle multiplicity in  $pp$  collisions is discussed as well.

## Category

Experiment

## Collaboration

ALICE

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