Contribution ID: **92**   Type: **Poster**

Measurement of electroweak-boson production in p-Pb and Pb-Pb collisions at the LHC with ALICE

Tuesday 11 June 2019 18:45 (2 hours)

Electroweak bosons are created in the hard scattering processes at the initial stage of heavy-ion collisions and they are insensitive to the presence of the strongly-interacting medium. This makes them clean probes of the initial-state effects in heavy-ion collisions, such as the nuclear modification of the Parton Distribution Functions (nPDFs). Furthermore, their measurement in heavy-ion collisions is a powerful test of the binary scaling of hard processes as well as a reference for hot-matter effects on other probes.

The measurement of electroweak-boson production in p-Pb and Pb-Pb collisions at the LHC provides constraints on the nPDFs of (anti)quarks in phase-space regions which are poorly constrained from previous experiments.

At forward rapidity ($2.5 < y < 4$), ALICE can measure W and Z bosons via their muon decay in all collisions systems provided by the LHC. These measurements are complementary to those by ATLAS and CMS at central rapidity.

In this contribution, focus will be given to the most recent ALICE electroweak-boson measurements. Exploiting the data collected by ALICE in 2015 and 2018, centrality and rapidity-differential measurements of the Z-boson production yield in Pb-Pb collisions at $\sqrt{s_{\mathrm{NN}}} = 5.02$ will be discussed. The first measurement of the Z-boson production cross section in p-Pb collisions at $\sqrt{s_{\mathrm{NN}}} = 8.16$ TeV will also be shown as a function of rapidity. The status of ongoing W-boson analyses in various collision systems will also be reported. All the presented results will be compared to theoretical calculations including nPDFs.

Collaboration name

ALICE

Track

Others

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Session Classification: Poster session with "aperitivo"