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Electroweak probes as tools for understanding initial state effects in heavy ion collisions with the CMS detector

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Z bosons and the Drell-Yan process are considered as essential probes to study the initial state effects in nuclear collisions. The CMS experiment has measured differential cross sections of Z bosons decaying to pairs of leptons in lead-lead collisions at a nucleon-nucleon center-of-mass energy of 5.02 TeV. The second order Fourier coefficient of the azimuthal distribution of Z bosons are measured to be compatible with zero, showing that Z bosons do not experience significant final-state interactions. Yields of Z bosons are compared to Glauber model predictions and are found to deviate from these expectations in peripheral collisions, indicating the presence of initial collision geometry and centrality selection effects. The precision of the measurement allows, for the first time, for a data-driven determination of the nucleon-nucleon integrated luminosity as a function of lead-lead centrality, thereby eliminating the need for its estimation based on a Glauber model. The results of the Drell-Yan process are also reported in pPb collisions at center-of-mass energy of 8.16 TeV. The differential cross sections are presented in a wide dimuon mass range down to 15 GeV/c^2. In addition, the forward-backward asymmetries are presented, providing useful information to probe the presence of nuclear effects. All results are compared to CT14, EPPS16, and nCTEQ15WZ (n)PDFs, to better understand the nuclear PDF and the sensitivity of the detailed models.

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