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Electroweak boson and forward jet probes of the initial state in Pb+Pb and p+Pb collisions with ATLAS

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Measurements of electroweak bosons produced in Pb+Pb collisions as well as photon and jet production in small collision systems are of great interest to understanding the partonic structure of heavy nuclei, and serve as a constraint on the initial state in large collision systems. These channels are sensitive to a broad set of physics effects such as the modification of the parton densities in nuclei, including the onset of non-linear QCD or saturation effects at low- x , and the energy loss of partons in the nucleus before the hard scattering. This talk presents results on photon and dijet production in p +Pb collision data recorded in 2016 by the ATLAS experiment. Measurements of forward-forward and forward-central di-jet yields and azimuthal angular correlations are reported in 5.02 TeV p +Pb and pp collisions, including jets up to $y = 4$ in the center of mass frame. Photon yields are reported in 8.16 TeV p +Pb data over a wide kinematic range, $p_T = 25$ -500 GeV and $|\eta| < 2.37$, and the production rates are compared to an extrapolated pp reference based on existing 8 TeV collision data. The measured spectra are used to construct nuclear modification factors and forward/backward ratios. These are compared to theoretical calculations of initial state energy loss and to the expectations from the modifications of parton distribution functions in nuclei. This talk also presents ATLAS final results on W and Z boson production in 5.02 lead-lead collisions and photon and dijet production in p +Pb collisions. The resulting W and Z nuclear modification factors are shown differentially in p_T , rapidity and centrality.

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