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Community Support for Physics with high-luminosity proton-nucleus collisions at the LHC

This document promotes the physics case for the operation of high-luminosity proton-nucleus pA collisions during Run 3 and 4 at the LHC. The collection of $\mathcal{O}$(1–10 pb^{-1}) of proton-lead (pPb) collisions at the LHC will provide broad and unique physics reach on multiple fronts including proton and nuclear Parton Distribution Functions (PDFs and nPDFs), Generalised Parton Distributions (GPDs), Transverse Momentum Dependent PDFs (TMDs), low-x QCD and parton saturation, hadron spectroscopy, baseline studies for quark-gluon plasma and parton collectivity, double and triple parton scatterings (DPS/TPS), photon-photon collisions, and physics beyond the Standard Model (BSM); which are not otherwise as clearly accessible by exploiting data from any other colliding system at the LHC. This report summarises the accelerator aspects of high-luminosity pA operation at the LHC, as well as each of the physics topics outlined above, including the relevant experimental measurements that motivate -much- larger pA datasets.

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