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Novel high-luminosity fixed-target experiment at the LHC

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Extraction of the multi-TeV proton and lead LHC beams with a bent crystal or by using an internal gas target allows one to perform the most energetic fixed-target experiment ever. pp, and pA collisions at collision energy of 115 GeV and PbP and PbA collisions at 72 GeV can be studied with high precision and modern techniques over a broad rapidity range. Using the LHCb and ALICE detectors in a fixed-target mode offers unprecedented possibilities to study, among others: the quark, gluon and heavy-quark content of the nuclei in the poorly known region of the high-momentum fractions, heavy-flavour production in a new energy domain, half way between the SPS and RHIC.

In this talk, the technical solutions to obtain a high-luminosity fixed-target experiment at the LHC will be reviewed and their possible implementations with the ALICE and LHCb detectors will be discussed. Projection studies for various observables such as Drell-Yan, charm, beauty and quarkonium production, with both detector set-ups used and with various nuclear targets and the LHC lead beams will be presented.

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