Advances in High Energy Physics

Special Issue on

Physics at a Fixed-Target Experiment Using the LHC Beams

CALL FOR PAPERS

Fixed-target experiments (FTE) have brought essential contributions to particle and nuclear physics. They have led to particle discoveries (Ω, J/ψ, ,...) and evidence for the novel dynamics of quarks and gluons in heavy-ion collisions. In accessing high x_F and in offering options for (un-) polarised proton and nuclear targets, they have also led to the observation of surprising QCD phenomena. They offer specific advantages compared to collider experiments: access to high x_F, high luminosities, target versatility, and polarisation.

The LHC 7 TeV protons on targets release a c.m.s. energy close to 115 GeV (72 GeV with Pb), in a range never explored so far, significantly higher than that at SPS and not far from RHIC. The production of quarkonia, DY, heavy flavours, jets, and γ in *pA* collisions can be studied with statistics previously unheard of and in the backward region, $x_F < 0$, which is uncharted. High precision QCD measurements can also obviously be carried out in *pp* and *pd* collisions with H_2 and D_2 targets. With the 50 TeV protons of the future circular collider (FCC), the c.m.s. energy could reach 300 GeV for original studies of W and Z boson, and perhaps H^0, production in *pp* and *pA* collisions.

With the LHC Pb beam, one can study the quark-gluon plasma (QGP) from the viewpoint of the nucleus rest frame after its formation. Thanks to modern technologies, studies of, for instance, direct γ and quarkonium *P*-waves production in heavy-ion collisions can be envisioned.

Polarising the target allows one to study single-spin correlations including the Sivers effect, hence, the correlation between the parton k_T and the nucleon spin.

We intend to publish a special issue on the physics at such a FTE using the LHC or FCC beams. The editors welcome original research articles and review articles from both theorists and experimentalists.

Potential topics include, but are not limited to:

- Heavy-quark and gluon content at large *x*
- TMDs and single-spin asymmetries
- Heavy-flavour studies in *pA* and *AA* collisions at FTEs
- W, Z, and H^0 production near threshold
- Target polarisation
- Secondary beams
- Simulation tools for high-energy physics
- Beam collimation and extraction with bent crystals
- Machine feasibility and radiological aspects
- Connection between UHECR studies and FTEs

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