

Physics case for a polarised target for AFTER@LHC

Tuesday 15 September 2015 09:00 (30 minutes)

In this talk, we review a number of recent ideas* put forward in favour of the use of a polarised target along with the proposed idea [Bro13] of a fixed-target experiment using the LHC beams - AFTER@LHC. If used in such a fixed-target mode, the multi-TeV LHC beams allow one to perform the most energetic fixed-target experiments ever and to study with high precision pp, pd and pA collisions at $\sqrt{s_{NN}} \sim 115$ GeV and Pbp and PbA collisions at $\sqrt{s_{NN}} \sim 72$ GeV. Such studies, covering quarkonia and heavy-flavour production in the QGP, hyper-nucleus production in the target region, cold-nuclear matter studies, ultra-peripheral collisions, and last but not least, single-spin asymmetries at backward rapidities, would greatly complement collider experiments, in particular those of RHIC and the EIC project.

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A number of recent studies [Ans15,Kan15,Liu12] have shown that single transverse-spin asymmetries (STSA) are large enough to be precisely measured in the region accessible with AFTER@LHC, in particular as regards the Drell-Yan process as well as single-pion, isolated-photon and jet productions. AFTER@LHC with a polarised target would also be the ideal experimental set-up to measure the gluon Sivers effects [Boe15] via a number of original STSA quarkonium studies [Lan15]. We will show first simulations [Mas15] for AFTER@LHC, including feasibility studies for quarkonium measurements in pp collisions and address the requested characteristics to perform such measurements for a polarised target, internal (as discussed in [Bar15]) or used with a dedicated beamline.

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REFERENCES:

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*: for a complete list of references see

http://after.in2p3.fr/after/index.php/Recent_published_ideas_in_favour_of_AFTER@LHC

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[Bro13] Physics Opportunities of a Fixed-Target Experiment using the LHC Beams

By S.J. Brodsky, F. Fleuret, C. Hadjidakis, J.P. Lansberg.

arXiv:1202.6585 [hep-ph]. Phys.Rept. 522 (2013) 239-255.

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[Ans15] Transverse single-spin asymmetries in proton-proton collisions at the AFTER@LHC experiment in a TMD factorisation scheme

By M. Anselmino, U. D'Alesio, S. Melis.

arXiv:1504.03791 [hep-ph]. Adv. in High Energy Phys. (2015) Article ID 475040 (in press).

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[Kan15] Transverse single-spin asymmetries in proton-proton collisions at the AFTER@LHC experiment

By K. Kanazawa, Y. Koike, A. Metz, D. Pitonyak.

arXiv:1502.04021 [hep-ph]. Adv. in High Energy Phys. (2015) Article ID 257934 (in press).

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[Liu12] Azimuthal asymmetries in lepton-pair production at a fixed-target experiment using the LHC beams (AFTER)

By Tianbo Liu, Bo-Qiang Ma.

arXiv:1203.5579 [hep-ph]. Eur.Phys.J. C72 (2012) 2037

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[Boe15] The gluon Sivers distribution: status and future prospects

By Daniël Boer, Cédric Lorcé, Cristian Pisano, Jian Zhou.

arXiv:1504.04332 [hep-ph]. Adv. in High Energy Phys. (2015) Article ID 371396 (in press).

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[Lan15] Spin physics and TMD studies at A Fixed-Target Experiment at the LHC (AFTER@LHC)
By J.P. Lansberg et al..
arXiv:1410.1962 [hep-ex]. EPJ Web Conf. 85 (2015) 02038.

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[Mas15] Feasibility studies for quarkonium production at a fixed-target experiment using the LHC proton and lead beams (AFTER@LHC)
By L. Massacrier, B. Trzeciak, F. Fleuret, C. Hadjidakis, D. Kikola, J.P. Lansberg, H. -S. Shao.
arXiv:1504.05145 [hep-ex]. Adv. in High Energy Phys. (2015) Article ID 986348 (in press).

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[Bar15] A Gas Target Internal to the LHC for the Study of pp Single-Spin Asymmetries and Heavy Ion Collisions
By C. Barschel, P. Lenisa, A. Nass, and E. Steffens
Adv. in High Energy Phys. (2015) Article ID 463141 (in press).

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