Contribution ID: **79**

Type: **not specified**

Precision proton-nucleus collision studies at A Fixed-Target ExpeRiment at the LHC (AFTER@LHC)

Thursday, 12 September 2013 18:40 (20 minutes)

We outline the physics opportunities [1] which are offered by a next generation and multi-purpose fixed-target experiment exploiting the LHC beams extracted by a bent crystal. This mature extraction technique offers an ideal way to obtain a clean and very collimated high-energy beam, without altering at all the performance of the LHC [2,3,4]. The multi-TeV LHC beams grant the most energetic fixed-target experiment ever performed, to study pp, pd and pA collisions at sqrt(s_NN) ˜ 115 GeV and PbA collisions at sqrt(s_NN) ˜ 72 GeV. AFTER – for A Fixed-Target ExperRiment – gives access to new domains of particle and nuclear physics complementing that of collider experiments, in particular RHIC and the projects of electron-ion colliders. The typical instantaneous luminosity achievable with AFTER in pp and pA mode [1] surpasses that of RHIC by more than 3 orders of magnitude and is comparable to that of the LHC collider mode, without pile-up thanks to the slow extraction mode. This provides a quarkonium and heavy-flavour observatory [5] in pp and pA collisions where, by instrumenting the target-rapidity region, gluon and heavy-quark distributions of the proton, the neutron and the nuclei can be accessed at large x and even at x larger than unity in the nuclear case. The nuclear target-species versatility provides a unique opportunity to study the nuclear matter versus the hot and dense matter formed in heavy-ion collisions, including the formation of the quark-gluon plasma. Modern detection technology should allow for the study of quarkonium excited states, in particular the chi(c) and chi(b) resonances, even in the challenging high-multiplicity environment of pA and PbA collisions, thanks to the boost of the fixed-target mode. Precise data from pp, pA should help to better understand heavy-quark and quarkonium production as well as their correlations with isolated photons, to clear the way to use them for gluon and heavy-quark PDF extraction in free and bound nucleons, to unravel cold from hot nuclear effects and to restore the status of heavy quarkonia as a golden probe of the QGP formation. The fixed-target mode also has the advantage to allow for spin measurements with polarized targets.

[1] S. J. Brodsky, F. Fleuret, C. Hadjidakis and J. P. Lansberg, Phys. Rept. 108 522 (2013) 239.

[2] E. Uggerhøj, U. I. Uggerhøj, Nucl. Instrum. Meth. B 234 (2005) 31.

[3] W. Scandale, et al., Phys. Lett. B 703 (2011) 547-551.

[4] W. Scandale, et al. [LUA9], CERN-LHCC-2011-007, 2011.

[5] J. P. Lansberg, S. J. Brodsky, F. Fleuret and C. Hadjidakis, Few Body Syst. 53 (2012) 11-25

Primary authors: RAKOTOZAFINDRABE, Andry (CEA/IRFU,Centre d'etude de Saclay Gif-sur-Yvette (FR)); GENOLINI, Bernard (IPN Orsay (CNRS-IN2P3-Univ. Paris Sud)); LORCE, Cedric (IPN Orsay, Paris Sud U.); HADJIDAKIS, Cynthia (Universite de Paris-Sud 11 (FR)); GONZALEZ FERREIRO, Elena (Universidad de Santiago de Compostela); SCOMPARIN, Enrico (Universita e INFN (IT)); FLEURET, Frédéric (LLR Ecole Polytechnique, IN2P3/CNRS); SCHIENBEIN, Ingo (Universite Joseph Fourier); LANSBERG, Jean-Philippe (IPN Orsay, Paris Sud U. / IN2P3-CNRS); DIDELEZ, Jean-Pierre (IPN Orsay, Paris Sud U. / IN2P3-CNRS); ANSELMINO, Mauro (Unknown); ROSIER, Philippe (IPN Orsay, Paris Sud U. / IN2P3-CNRS); ULRICH, Ralf Matthias (KIT - Karlsruhe Institute of Technology (DE)); ARNALDI, Roberta (Universita e INFN (IT)); BRODSKY, Stanley J. (SLAC); UGGERHOJ, Ulrik (Aarhus University (DK)); CHAMBERT, Valerie (IPN Orsay)

Presenter: LANSBERG, Jean-Philippe (IPN Orsay, Paris Sud U. / IN2P3-CNRS)

Session Classification: Parallel talks - Session 2B