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Polarization analysis of antiprotons produced in pA collisions

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Abstract content

A polarized antiproton beam would allow for the extraction of more detailed information in various fields like the structure of hadrons and their interaction but till now, although possible methods have been discussed since the first antiproton beams were produced [1], no simple procedure for the preparation of a well defined polarized antiproton beam is available. The actual favored solution is the spin filter method where a stored unpolarized antiproton beam is polarized by passing through a polarized target. Due to the spin dependent interaction one polarization component is depleted and after a certain storage time a beam polarization is build up. The technique in principle works as shown with protons but it is rather effortful [2]. A quite simple procedure for the generation of a polarized antiproton beam could be worked out if antiprotons are produced with some polarization. In order to investigate this possibility measurements of the polarization of produced antiprotons have been started at a CERN/PS testbeam. Secondary particles produced with the PS beam were transferred through a beam line adjusted to 3.5 GeV/c momentum to a detection system which includes a liquid hydrogen analyzer target, tracking detectors, scintillators, a Cherenkov detector to veto the dominant pion background and a DIRC for the particle identification. The polarization will be determined from the asymmetry of the elastic antiproton scattering at the liquid hydrogen target in the CNI region for which the analyzing power is well known. The tracks of beam and scattered particle are reconstructed from drift chamber signals and the particle identification is done by the Cherenkov cone in the DIRC.
The data are still under analysis and in order to improve the statistics an additional measurement is planned for summer 2018. Details on the experiment and the ongoing data analysis [3,4] will be given.
References:
[1] A. D. Krisch, AIP Conf. Proc. 145 (1986).
[2] W. Augustyniak et al., Phys. Lett. B 718 64-69 (2012).
[3] D. Alfs et al., Acta Phys. Pol. B 48 1983 (2017).
[4] D. Grzonka et al., Acta Phys. Pol. B 46, 191 (2015).

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