

理化学研究所原子核セミナー 2005. 8. 1

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(Kyoto University)

題目： Absolute polarimetry in RHIC – How to measure the beam polarization? What is the principle?

* The seminar will be given in *English*.

日時： 2005年 8月 1日 (Mon.) 14:00 –

場所： RIKEN Main Bldg. 2F Seminar Room

Abstract

The precision measurement of beam polarization is a crucial part of the RHIC spin program. For example, a two-spin longitudinal asymmetry is defined as $A_{LL} = \epsilon_{LL}/P_{\text{beam}}^2$, where ϵ_{LL} is the measured (raw) asymmetry in a particular process for the parallel and anti-parallel spin configurations of polarized proton beams. Since the error of asymmetry would be directly reflected on the uncertainty of the physical observables which we are trying to extract, e.g., gluon polarization, it is very important to reduce the uncertainty in the beam polarization.

The RHIC Absolute Polarimeter allows us the best possible determination of the beam polarization. The polarimeter comprises a polarized hydrogen gas jet target system and a silicon spectrometer. The target system includes a Breit-Rabi polarimeter to obtain a precise absolute measurement of the target polarization. The silicon spectrometer counts the pp elastic scattering event yield of polarized hydrogen gas target and polarized proton beam in the very small momentum transfer [$-t \sim 0.003$ (GeV/c) 2]. By using a polarized target and a polarized beam simultaneously, the beam polarization can be determined with good precision ($\Delta P_{\text{beam}}/P_{\text{beam}} \sim \Delta P_{\text{target}}/P_{\text{target}}$) with a sufficient number of pp elastic events. In RUN04, we have completed the absolute beam polarization measurement (0.392 ± 0.026).

Although the pp elastic scattering process in the very small $-t$ region is ideal for a polarimeter application for a high-energy proton beam, there has been no precise measurement of the analyzing power (A_N), since it is extremely difficult to identify elastic scattering very small angles. In this talk, I will show the first precise measurement of A_N absolute value and shape versus $-t = 0.0015$ to 0.032 (GeV/c) 2 with a precision better than 0.005 for each A_N data point and discuss the principle.

* Host researcher : K. Tanida (RIKEN)

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