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Erratum

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A surprising method for polarising antiprotons

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Triggered by a criticism of A.I. Milstein, S.G. Salnikov and V.M. Strakhovenko [1] we have searched for the reason of the dramatic difference of our triple-spin transfer cross-section in the scattering of spin-1/2 hadrons from leptons [2]. We found a numerical problem in our calculation of the spin-dependent cross-sections [3,4]. After the correction of this problem the cross-sections are smaller by about 14 orders of magnitude. The corrected figs. 1–4 of ref. [2] are repeated in this erratum (in the following page).

Though some features as the ratio $\langle S_2^- \rangle / \langle S_2 \rangle = 0.49$ are more favorable now, the huge reduction of the cross-section kills the proposal. In order to arrive at similar polarisation times and figures of merits as in ref. [2] an increase of the positron density of about 13 orders of magnitude had to be achieved. As a realistic increase four orders appear to be possible today [5].

However, there still remains a difference between our and the calculation of ref. [1]. Whereas we get $\sigma^h_{-\lambda,\lambda,+} \approx 30\,\text{mbarn}$ for $\lambda = -$ and 0.5 mbarn for $\lambda = +$ at $T_h = 1.7\,\text{keV}$ A.I. Milstein, S.G. Salnikov and V.M. Strakhovenko get $\sigma_{total} = \sigma^h_{-,+,+} + \sigma^h_{+,-,+} = 0.75\,\text{mbarn}$. This difference may be due to their averaging over all relative initial directions of the hadron momentum with respect to the lepton spin.

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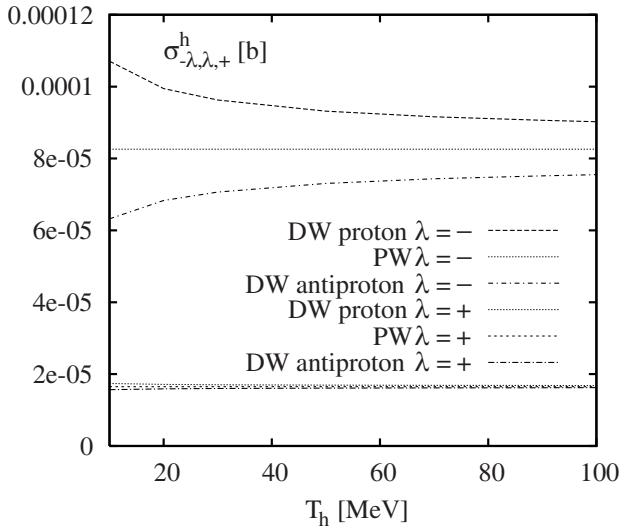

Fig. 1. The integrated spin-flip cross-sections $\langle\sigma^h_{-\lambda,\lambda,+}\rangle$ $(\lambda = \pm)$ for antiproton and proton electron scattering as a function of the proton lab kinetic energy T_h for $b = 10^{10}$ fm in PW and DW. The cross-section for proton and antiproton are identical in PW. It is easy to calculate the lepton kinetic energy in the proton rest system using the nonrelativistic relation $T_l = T_h(m_l/m_h)$.

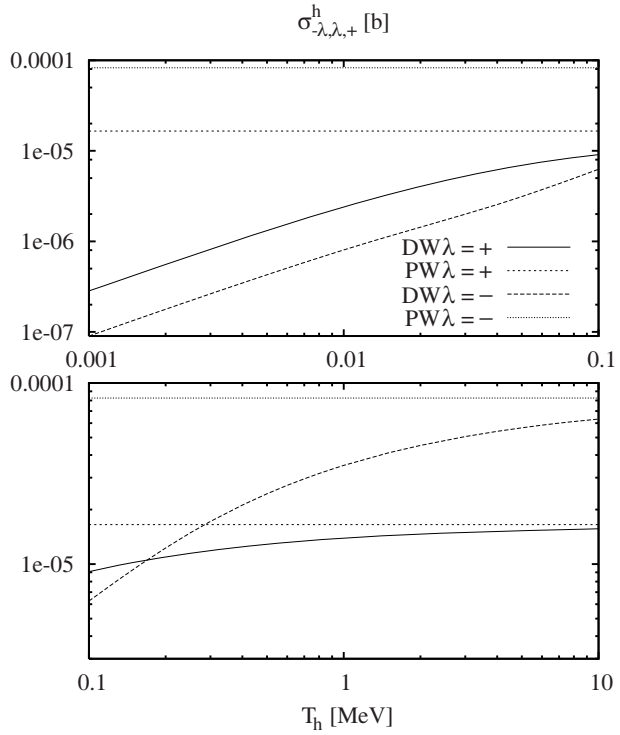

Fig. 2. The integrated spin-flip cross-sections $\langle\sigma^h_{-\lambda,\lambda,+}\rangle$ $(\lambda = \pm)$ for antiproton electron scattering as a function of the proton lab kinetic energy T_h for $b = 10^{10}$ fm in PW and DW.

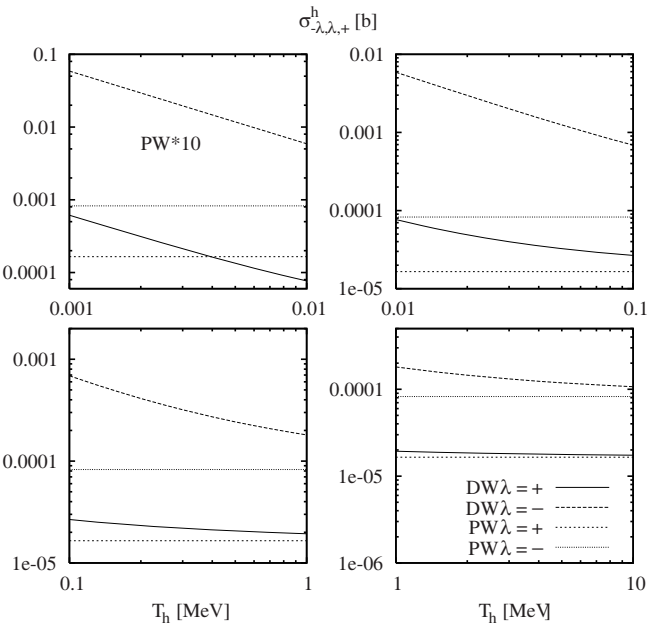

Fig. 3. The integrated spin-flip cross-sections $\langle\sigma^h_{-\lambda,\lambda,+}\rangle$ $(\lambda = \pm)$ for proton electron scattering as a function of the proton lab kinetic energy T_h for $b = 10^{10}$ fm in PW and DW.

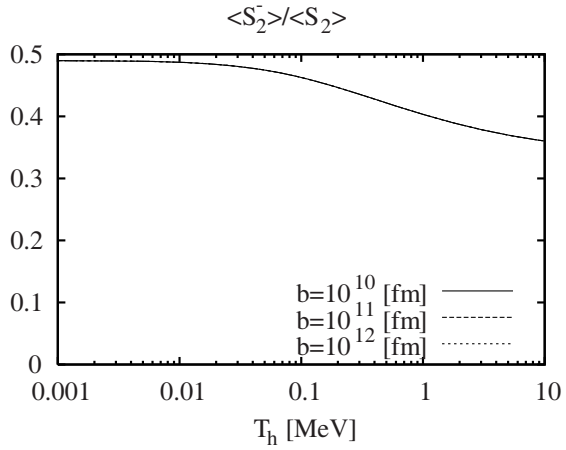

Fig. 4. Ratio of $\langle S_2^-\rangle/\langle S_2\rangle$ for proton electron scattering as a function of the proton lab kinetic energy T_h for the DW approximation.