Erratum: Spin asymmetries $A_1$ of the proton and the deuteron in the low $x$ and low $Q^2$ region from polarized high energy muon scattering
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(Spin Muon Collaboration)
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The virtual photon-proton (-deuteron) asymmetries $A_{1,d}^1$ presented in [1] were measured in the kinematic region where the four-momentum transfer $Q^2$ extended down to 0.01 GeV$^2$. A full account of the formalism is given in [2]. In this kinematic region one cannot neglect $m_p^2/Q^2$ terms in the expression for the cross section. These terms were correctly taken into account in the unpolarized part of the cross section, $\sigma$ [cf. Eq. (2.2) in [2]]; they were however omitted in the polarized part, $\Delta \sigma$ [Eqs. (2.4)–(2.6) in [2]].

The cross sections $\Delta \sigma ||$ and $\Delta \sigma T$, corresponding to the two configurations where the nucleon spin is either along or orthogonal to the muon spin [cf., Eq. (2.4) in [2]] should be written as follows:

\[
\frac{d^2 \Delta \sigma ||}{dxdQ^2} = 16\pi a^2 y \left[ 1 - \frac{y^2 y^2}{4} - \frac{m_p^2 y^2}{Q^2} g_1 - \frac{g_1}{2} g_2 \right]
\]

and

\[
\frac{d^3 \Delta \sigma T}{dxdQ^2 d\phi} = -\cos \phi \frac{8 a^2 y}{Q^4} \sqrt{1 - y} \gamma \sqrt{1 - y^2 y^2 / 4} \left[ 1 + \frac{2 m_p^2}{Q^2} \right] \left[ g_1 + g_2 \right].
\]

The measured asymmetries $A_1$ and $A_{1,2}$ are related to $A_1$ and $A_2$ [cf., Eqs (2.7)–(2.8) in [2]] through the depolarization factor $D$,

\[
D = \frac{y[(1 + y^2 y/2)(2 - y) - 2y^2 m_p^2/Q^2]}{y^2(1 - 2m_p^2/Q^2)(1 + y^2) + 2(1 + R)(1 - y - y^2 y^2 / 4)},
\]

the factor $d$ for the orthogonal spin configuration,

\[
d = \frac{\sqrt{1 - y - y^2 y^2 / 4(1 + y^2 y/2)}}{(1 - y/2)(1 + y^2 y/2) - y^2 m_p^2/Q^2} D,
\]

and kinematic factors $\eta$ and $\xi$,

\[
\eta = \frac{y(1 - y - y^2 y^2 / 4 - y^2 m_p^2/Q^2)}{(1 + y^2 y/2)(1 - y/2) - y^2 m_p^2/Q^2}.
\]

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The only approximation applied in these equations is in neglecting terms \( \frac{m_p^2}{Q^2} \) which are of the order of \( 10^{-7} \) in our kinematic range. With the above definition the depolarization factor is always smaller than unity.

The missing \( \frac{m_p^2}{Q^2} \) terms in the polarized part of the cross section is most apparent at low \( Q^2 \). Therefore our low \( x \), low \( Q^2 \) data presented in [1] were reanalyzed using the corrected equations. The results for the reanalyzed proton and deuteron spin asymmetries \( A_1^{p,d} \) and spin structure functions \( g_1^{p,d} \) are given here in Tables I and II for newly accessed region at low \( Q^2 \). The change in \( A_1^{p,d} \) and in its statistical error is significant only in the two bins corresponding to the smallest values of \( x \) and \( Q^2 \). The average values of \( x \) and \( Q^2 \) change in the first bin of \( x \) because \( D \) is used in the weight calculations. Changes at higher \( x \) are negligible and the physics conclusions given in [1] are unchanged.

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\xi = \frac{y(1 - y/2 - y^2 m_p^2/Q^2)}{1 + y^2/2}.
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