Comparison of the fits to data on polarised structure functions and spin asymmetries

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Abstract
In order to obtain polarised parton densities we have made next to leading order QCD fit using experimental data on deep inelastic structure functions on nucleons. This fit is compared with the updated fit to corresponding spin asymmetries. We get very similar results for all fits also for different data samples. It seems that only polarised parton densities for non-strange quarks $\Delta u$ and $\Delta d$ are relatively well determined from the present polarised deep inelastic experiments. Integrated gluon contribution at $Q^2 = 1\,\text{GeV}^2$ is, as in our previous fits, very small.
In order to get polarised parton (i.e. quark and gluon) densities one uses data on deep inelastic scattering of polarised lepton on polarised nucleon targets. Quite a lot of data exist for such scattering on different nucleon targets. The data come from experiments made at SLAC [1-10], CERN [11-16] and DESY [17, 18]. Recently the data from SLAC from E155 [10] experiment on protons has been published. The experimental groups present data for spin asymmetries as well as for polarised structure functions.

The analysis of the EMC group results [11] started an interest in studying such data. So called ”spin crisis” was connected with the fact that only very little of spin of nucleon was carried by quarks. The suggestion from ref. [19] was that polarised gluons may be responsible for this phenomena. Many next to leading (NLO) order QCD analysis [20-27] were performed and polarised parton distributions were determined. The main purpose of this paper is to use data for polarised structure functions \( g_1(x, Q^2) \) on proton, neutron and deuteron targets in order to determine polarised parton distributions. This fit will be compared with our updated (in which we take into account recently published data on protons from E155 [10] experiment in SLAC) fits to spin asymmetries. It was advocated by us [28] and [20] that using spin asymmetries for determination of polarised parton densities one avoids the problem with higher twist contributions. On the other hand it is the polarised structure functions and polarised parton distributions that we want to determine.

We compare these two ways of making fits with similar technical assumptions and the same parton functions used for fitting. We will see that both methods give very similar results for parton distributions. Our previous [26, 27] important conclusion that the integrated gluon contribution is negligible at \( Q^2 = 1 \text{ GeV}^2 \) does not change. Most of the groups used experimental data for spin asymmetries to determine polarised parton distributions. In addition to spin asymmetries one has also experimental data for polarised structure functions calculated from the spin asymmetries in a specific way chosen by an experimental group. There were also several fits to the data on polarised structure functions [21, 22]. As in [26, 27] we will make fits to two samples of the data. In the first group we will have data for the same \( x \) (strictly speaking for the near values) and different \( Q^2 \) and in the second the ”averaged” data where one averages over \( Q^2 \) (the errors are smaller and \( Q^2 \) dependence is smeared out). In most of the fits to experimental data only second sample (namely with averaged \( Q^2 \) dependence) was
used. Our fits use the both sets of data. The data for polarised structure functions are usually given only for averaged sample of data (the exception is E155 experiment for deuteron and proton data).

Experiments on unpolarised targets provide information on the unpolarised quark densities \( q(x, Q^2) \) and \( G(x, Q^2) \) inside the nucleon. These densities can be expressed in term of \( q^\pm(x, Q^2) \) and \( G^\pm(x, Q^2) \), i.e. densities of quarks and gluons with helicity along or opposite to the helicity of the parent nucleon.

\[
q = q^+ + q^-, \quad G = G^+ + G^-.
\]  

\( q \) stands for quark and antiquark contributions.

The polarised parton densities, i.e. the differences of \( q^+ \), \( q^- \) and \( G^+ \), \( G^- \) are given by:

\[
\Delta q = q^+ - q^-, \quad \Delta G = G^+ - G^-.
\]

We will try to determine \( q^\pm(x, Q^2) \) and \( G^\pm(x, Q^2) \), in other words, we will try to connect unpolarised and polarised data.

In our fits we will use functions for the polarised parton densities that are suggested by the fit to unpolarised data. We risk that asymptotic behaviour of our parton distributions is not correct but it seems to us not so important when we limit ourselves to the measured region of \( x \). Maybe it is also not bad to use parametrisation completely different from other groups to check how the results depend on that. Our starting point are the formulas for unpolarised quark and gluon distributions gotten (at \( Q^2 = 1 \text{ GeV}^2 \)) from the fit performed by Martin, Roberts, Stirling and Thorne [29] (they use \( \Lambda_{\overline{MS}}^{nf=4} = 0.3 \text{ GeV} \) and \( \alpha_s(M_Z^2) = 0.120 \))

We will not use small and high \( x \) behaviour of unpolarised parton distributions as fitted parameters as some other groups do. We will split \( q \) and \( G \), as was already discussed in ref. [24, 27], into two parts in such a manner that the distributions \( q^\pm(x, Q^2) \) and \( G^\pm(x, Q^2) \) remain positive. Our polarised densities for quarks and gluons are parametrised as follows:

\[
\begin{align*}
\Delta u_v(x) &= x^{-0.5911}(1 - x)^{3.395}(a_1 + a_2 \sqrt{x} + a_4 x), \\
\Delta d_v(x) &= x^{-0.7118}(1 - x)^{3.874}(b_1 + b_2 \sqrt{x} + b_3 x), \\
2\Delta \bar{u}(x) &= 0.4\Delta M(x) - \Delta \delta(x), \\
2\Delta \bar{d}(x) &= 0.4\Delta M(x) + \Delta \delta(x),
\end{align*}
\]  

(3)
\[2\Delta \bar{s}(x) = 0.2\Delta M_s(x),\]
\[\Delta G(x) = x^{-0.0829}(1 - x)^{6.587}(d_1 + d_2\sqrt{x} + d_3x).\]

whereas for the antiquarks (and sea quarks):
\[\Delta M(x) = x^{-0.7712}(1 - x)^{7.808}(c_1 + c_2\sqrt{x}),\]
\[\Delta M_s = x^{-0.7712}(1 - x)^{7.808}(c_{1s} + c_{2s}\sqrt{x}),\]
\[\Delta \delta(x) = x^{0.183}(1 - x)^{9.808}c_3(1 + 9.987x - 33.34x^2),\] (4)

We also have
\[\Delta u = \Delta u_v + 2\Delta \bar{u},\]
\[\Delta d = \Delta d_v + 2\Delta \bar{d},\]
\[\Delta s = 2\Delta \bar{s},\] (5)

We use as before [26, 27] additional independent parameters for the strange sea contribution with the same as for non-strange sea functional dependence. Maybe not all parameters are important in the fit and it could happen that some of the coefficients in eq.(3,4) taken as free parameters in the fit are small or in some sense superfluous. Putting them to zero (or eliminating them) increase \(\chi^2\) only a little but makes the quantity \(\chi^2/N_{DF}\) smaller. We will see that that is the case with some parameters introduced in eq. (3,4).

In order to get the unknown parameters in the expressions for polarised quark and gluon distributions (eqs.(3,4)) we calculate the spin asymmetries (starting from initial \(Q^2 = 1\) GeV\(^2\)) for measured values of \(Q^2\) and make a fit to the experimental data on spin asymmetries for proton, neutron and deuteron targets. The spin asymmetry \(A_1(x, Q^2)\) can be expressed via the polarised structure function \(g_1(x, Q^2)\) as
\[A_1(x, Q^2) \simeq \frac{(1 + \gamma^2)g_1(x, Q^2)}{F_1(x, Q^2)} = \frac{g_1(x, Q^2)}{F_2(x, Q^2)}[2x(1 + R(x, Q^2))],\] (6)

where \(R = [F_2(1 + \gamma^2) - 2xF_1]/2xF_1\) whereas \(F_1\) and \(F_2\) are the unpolarised structure functions and \(\gamma = 2Mx/Q\) (\(M\) stands for proton mass). We will take the new determined value of \(R\) from the [30]. The factor \((1 + \gamma^2)\) plays non negligible role for \(x\) and \(Q^2\) values measured in SLAC experiments. In
calculating $g_1(x, Q^2)$ and $F_2(x, Q^2)$ in the next to leading order we use procedure described in [26] following the method described in [20, 31] performing calculations with Mellin transforms and then calculating Mellin inverse. Having calculated the asymmetries according to equation (6) for the value of $Q^2$ obtained in experiments we can make a fit to asymmetries on proton, neutron and deuteron targets. The other possibility is to use directly the data for the polarised structure function $g_1(x, Q^2)$ (the values of $g_1$ were given for the averaged values of $Q^2$) on proton, neutron and deuteron targets to determine unknown coefficients in expressions for polarised parton distributions. The problem is that different experimental groups used their own specific methods to obtain the values of polarised structure functions $g_1(x, Q^2)$ from the measured asymmetries. At the end we want to know polarised structure functions and polarised parton distributions. In order to calculate them from spin asymmetries we have to choose what shall we take for $F_1(x, Q^2)$ or $F_2(x, Q^2)$ and $R(x, Q^2)$. As was already mentioned we calculated $F_2(x, Q^2)$ in NLO for actual values of $x$ and $Q^2$ using quark and gluon contributions for $Q^2 = 1$ GeV$^2$ given by MRST [29]. The values of $R$ were in the earlier fits taken from Whitlow [32] and later from E143 group [30]. We have treated all experiments in the same way. There is also a problem of higher twist corrections (power low corrections to $R$ were included). We will not include the higher twist corrections because of still big experimental errors. The spread of the results could be a measure of uncertainties in both methods. We will compare fits using determination of parameters from polarised structure functions and from spin asymmetries. As will be seen later the results obtained by two methods are very similar.

It was already seen from our previous paper [27] that $g_1(x, Q^2)$ calculated from spin asymmetries fits not bad the data points for $g_1$. Data points for polarised structure functions were given for averaged data set so it is natural to compare fit to $g_1$ (called by us fit $g$) with the fit to spin asymmetries (fit $A_1$) with the same number of points. We will take into account in this case 197 data points (We will take E155 proton and deuteron data without averaging). These fits will be compared with the fit (fit $A_2$) to spin asymmetries for non averaged data where we take into account 465 experimental data points. At the beginning we will not put any constrains from hyperon decays. Later we will also not fix $a_8 = \Delta u + \Delta d - 2\Delta s$ value but we will add experimental point $a_8 = 0.58 \pm 0.1$ with enhanced (to 3$\sigma$) error. That means we will simply add to $\chi^2$ corresponding to experimental points for spin asymmetries
the term connected with experimental point from hyperon decays. We will discuss how this additional experimental point influences our results.

Not all parameters are important in the fits. It seems that some of the parameters of the most singular terms are superfluous and we can eliminate them. We will put $d_1 = 0$ (such assumption gives that $\delta G/G \sim x^{1/2}$ for small $x$), $b_1 = 0$ (the most singular term in $\Delta d_v$) and assume $c_{1s} = c_1$ (i.e. the most singular terms for strange and non-strange sea contributions are equal). Fixing these four parameters in the fit practically does not change the value of $\chi^2$ but improves $\chi^2/N_{DF}$. We also have to make some remarks about parameters $c_3$ and $d_2$. In the fit for $g_1$ these parameters are important i.e. when we eliminate them $\chi^2$ per degree of freedom increases. That is not the case in fits for spin asymmetries. In this case these parameters are superficial (that means for example that splitting $\bar{u} - \bar{d}$ is not well defined by data to spin asymmetries. We will leave this parameters for comparison with fit to $g_1$ (do not eliminate them) but they could be not well determined and cause some artificial shifts in other parameters.

Table 1. The parameters of our three fits calculated at $Q^2 = 1 \text{GeV}^2$ together with $\chi^2$ per degree of freedom

| fit  | $a_1$    | $a_2$    | $a_4$    | $b_2$    | $b_3$    | $c_1$   |
|------|----------|----------|----------|----------|----------|---------|
| fit g| 0.61     | -7.05    | 17.1     | -2.02    | 0.34     | -0.34   |
|      | $\pm 0.0$| $\pm 0.23$| $\pm 0.23$| $\pm 0.0$| $\pm 0.24$| $\pm 0.03$|
| fit A1| 0.56     | -5.50    | 14.7     | -1.67    | -0.173   | -0.338  |
|      | $\pm 0.13$| $\pm 1.22$| $\pm 1.66$| $\pm 0.03$| $\pm 0.26$| $\pm 0.10$|
| fit A2| 0.49     | -5.34    | 14.66    | -2.02    | 0.35     | -0.32   |
|      | $\pm 0.13$| $\pm 1.20$| $\pm 1.63$| $\pm 0.0$| $\pm 0.25$| $\pm 0.10$|

| fit  | $c_2$    | $c_2s$   | $c_3$    | $d_2$    | $d_3$    | $\chi^2/N_{DF}$ |
|------|----------|----------|----------|----------|----------|-----------------|
| fit g| 4.15     | 4.15     | -1.05    | -29.0    | 87.1     | 0.87            |
|      | $\pm 0.0$| $\pm 0.0$| $\pm 0.56$| $\pm 8.6$| $\pm 36.1$|                 |
| fit A1| 3.23     | 4.15     | -0.617   | -15.4    | 42.2     | 0.81            |
|      | $\pm 0.80$| $\pm 0.22$| $\pm 0.58$| $\pm 0.22$| $\pm 15.0$|                 |
| fit A2| 3.69     | 4.15     | -0.39    | -14.0    | 27.0     | 0.84            |
|      | $\pm 0.79$| $\pm 0.20$| $\pm 0.48$| $\pm 0.04$| $\pm 11.4$|                 |
In the Table 1 we present the values of parameter from the fit to the data on polarised structure functions and spin asymmetries for averaged and non averaged data together with $\chi^2/N_{DF}$ values.

For example in the case of first row in table 1 corresponding to the fit to polarised structure functions the obtained quark and gluon distributions lead for ($Q^2 = 1 \text{ GeV}^2$) to the following integrated (over $x$) quantities: $\Delta u = 0.72, \Delta d = -0.64, \Delta s = 0.05, \Delta u_v = 0.54, \Delta d_v = -0.65, 2\Delta \bar{u} = 0.18, 2\Delta \bar{d} = 0.01$.

We have positively polarised sea for up and down quarks and positively polarised sea for strange quarks. The gluon polarisation is small. The value of $a_3 = 1.36$ was not assumed as an input in the fit (as is the case in nearly all fits [23]) and comes out slightly higher than the experimental value. The value of $a_8 = -0.01$ is completely different from the experimental figure. Taking into account that fits to polarised structure functions and spin asymmetries use different methods to calculate $F_2(x, Q^2)$ and $R(x, Q^2)$ there is no reason to expect that they give exactly the same results. The obtained values of parameters are very close and practically within experimental errors. The parameters calculated in fits to spin asymmetries (line 2 and 3) are closer in comparison with fit to $g_1$ (line 1) but are not identical. The spread of parameters measures small differences in the $Q^2$ evolution, differences in experimental errors and influence of our specific functions used in fits.

As was already mentioned in [26] the asymptotic behaviour at small $x$ of our polarised quark distributions is determined by the unpolarised ones and hence do not have the expected theoretically Regge type behaviour. Some of the quantities specially integrated sea contributions and also some valence contributions in our fit change rapidly for $x \leq 0.003$, that is not something that we expect from Regge behaviour with small exponent.

Hence, we will present quantities integrated over the region from $x=0.003$ to $x=1$ (it is practically integration over the region which is covered by the experimental data, except of non controversial extrapolation for highest $x$). The values of integrated quantities in the measured region we consider as more reliable then those in the whole region.

The corresponding quantities for three our fits together with $\chi^2/N_{DF}$ are presented in table 1a.
Figure 1: The quark and gluon densities for up and down flavour versus $x$ gotten from the fit $g$ (solid line) and $A_1$ (dashed line).

Table 1a. The values of quark and gluon polarisations at $Q^2 = 1$ GeV$^2$
for our three fits

| fit  | $\Delta u$ | $\Delta d$ | $\Delta u_v$ | $\Delta d_v$ | $2\Delta \bar{u}$ | $2\Delta d$ | $2\Delta s$ | $\Delta G$ |
|------|------------|------------|-------------|-------------|-----------------|-------------|-------------|-----------|
| fit $g$ | 0.74      | −0.49     | 0.44        | −0.63       | 0.30            | 0.14        | 0.11        | 0.15      |
| fit $A_1$  | 0.75      | −0.48     | 0.57        | −0.57       | 0.18            | 0.09        | 0.11        | 0.01      |
| fit $A_2$  | 0.76      | −0.47     | 0.54        | −0.63       | 0.22            | 0.16        | 0.12        | −0.19     |

From the table we see that there are changes in valence and sea contributions in different fits but the values of $\Delta u$ and $\Delta d$ practically do not differ. We use the parametrisation where the most singular term in sea contribution is very similar to valence quark terms and that maybe is the reason why splitting into valence and sea contribution is fragile and changes for different fits but in the case of $\Delta u$ and $\Delta d$ do not differ much. In the first fit at $Q^2 = 1$ GeV$^2$ we get $\Gamma_1^p = 0.124$, $\Gamma_1^n = −0.052$, $a_3 = 1.23$ and $\Delta \Sigma = 0.36$ comparing with the second fit to averaged spin asymmetries where we have $\Gamma_1^p = 0.125$, $\Gamma_1^n = −0.051$, $a_3 = 1.24$ and $\Delta \Sigma = 0.38$. These results are very close. The value of $a_3$ in the measured region without any assumption comes out close to the value measured in hyperon decays.

For illustration we present in Fig.1 the distributions $\Delta u$ and $\Delta d$ for our sets of parameters calculated from polarised structure functions and the sample of averaged spin asymmetries data. The corresponding values for $\Delta u_v$ and $\Delta d_v$ differ much stronger. In our previous paper [27] we already presented how the values of polarised structure functions for proton, deuteron
Figure 2: The comparison of our predictions for $g_1^N(x,Q^2)$ versus $x$ with experimental data from different experiments. Solid curve is gotten from fit $g$, the dashed one is calculated using the parameters of fit $A_1$. 
and neutron calculated from the fits to spin asymmetries compare with the experimental data. To see what is the difference in the values fitted directly to the polarised structure functions and the values calculated from the fit to spin asymmetries we present in Fig.2 the corresponding curves in comparison with experimental points for $g_1^p$, $g_1^d$ and $g_1^n$ at the values of $Q^2$ in corresponding experiment. As an example we show comparison with experimental points for polarised structure functions $g_1^p$, $g_1^d$ from SMC from CERN and E143 from SLAC and $g_1^n$ from E142 and E154 from SLAC. There are some differences but they are not big in comparison with experimental errors. The comparisons for other experimental sets look very similar. It is of course not astonishing that the fitted curves with the parameters from the first fit are closer to experimental values.

As we already pointed out before we have not made any assumptions about $a_8$. We got from the fits that the value of $a_8$ is near zero very far from the experimental value and we got positive values for $\Delta s$. The value of $a_3$ that also was not constrained in the fit is close to experimental value (in the measured region of $x$). In order to make more direct comparison with other fits as before we will also not fix $a_8 = \Delta u + \Delta d - 2\Delta s$ value but we will add experimental point $a_8 = 0.58 \pm 0.1$ with enhanced (to 3$\sigma$) error. That means we will simply add to $\chi^2$ corresponding to experimental points for spin asymmetries the term connected with experimental point from hyperon decays. The parameters of our three new fits (called $g', A'_1$ and $A'_2$) are now presented in Table 2 and results in the measured region in $0.003 \leq x \leq 1$ in the Table 2a.
Table 2. The parameters of three new fits calculated at $Q^2 = 1$ GeV$^2$

| fit        | $a_1$ | $a_2$  | $a_4$ | $b_2$ | $b_3$ | $c_1$ |
|------------|-------|--------|-------|-------|-------|-------|
| fit $g'$   | 0.61  | -6.84  | 16.83 | -1.86 | 0.13  | -0.31 |
| fit $A'_1$ | 0.56  | -5.51  | 14.73 | -1.65 | -0.21 | -0.34 |
| fit $A'_2$ | 0.50  | -5.39  | 14.72 | -1.98 | 0.29  | -0.33 |

| fit        | $c_2$ | $c_{2s}$ | $c_3$ | $d_2$ | $d_3$ | $\chi^2/N_{DF}$ |
|------------|-------|----------|-------|-------|-------|-----------------|
| fit $g'$   | 4.15  | -0.54    | -1.04 | -34.5 | 102.2 | 0.88            |
| fit $A'_1$ | 3.67  | -0.63    | -0.64 | -15.8 | 43.5  | 0.80            |
| fit $A'_2$ | 4.15  | -0.56    | -0.44 | -14.2 | 27.6  | 0.84            |

There are some small changes in the parameters in comparison to the fits $g$, $A_1$, $A_2$ and the biggest change is in $c_{2s}$, the parameter responsible for the strange sea. Strange quark contribution is not well determined by the polarised deep inelastic data alone and it is easy by additional experimental point on $a_8$ from hyperon decays to shift the value of $a_8$ from nearly zero to correct experimental value with only small changes in non strange parton parameters. Comparing Table 1a and Table 2a we can see what is the influence of this additional experimental point $a_8$ on integrated parton densities for our three fits. This additional experimental point causes shifts of integrated parton values. As is seen from Table 2a the valence non-strange quark distributions nearly cancel and the value of $a_8 = \Delta u + \Delta d - 2\Delta s = 0.58$ is built up from relatively high sea contributions. The values of $\Gamma_1^p$, $\Gamma_1^n$ and $\Delta_3$ do not change in comparison to previous fits. One can easily calculate from the Table 2a that $\Delta \Sigma = 0.24$ in the fits $g'$ and $A'_1$.

Table 2a. The values of quark and gluon polarisations at $Q^2 = 1$ GeV$^2$ for three new fits (where one includes experimental point from hyperon decays).

| fit        | $\Delta u$ | $\Delta d$ | $\Delta u_v$ | $\Delta d_v$ | $2\Delta \bar{u}$ | $2\Delta d$ | $2\Delta \bar{s}$ | $\Delta G$ |
|------------|-------------|------------|--------------|--------------|-------------------|-------------|-------------------|-----------|
| fit $g'$   | 0.79        | -0.44      | 0.47         | -0.60        | 0.32              | 0.16        | -0.11             | 0.16      |
| fit $A'_1$ | 0.80        | -0.44      | 0.57         | -0.57        | 0.23              | 0.13        | -0.12             | 0.01      |
| fit $A'_2$ | 0.80        | -0.43      | 0.54         | -0.62        | 0.26              | 0.19        | -0.11             | -0.19     |
However it is not clear whether the general conclusion that the sea contributions for quarks (both non-strange and strange) are very big in the measured $x$ region is correct. It is specific for our model that the leading singularity for polarised quark valence and sea contributions are comparable. That means that splitting into valence and sea contributions could be not well determined in our fits. That of course could be connected with the functional form of polarised parton densities used by us but what is important is to reproduce the results of the experiment in the measured region. That means that only $\Delta u$ and $\Delta d$ values can be determined using our parametrisation from the polarised deep inelastic data and not valence and sea contributions separately. The value of $\Delta s$ is determined only with additional $a_8$ value from hyperon decays. In our model $\Delta G$ is small. The integrated values $\Delta u = 0.80, \Delta d = -0.44$ are actually not unexpected. Similar values follow from the other models. In other fits [20, 33] with completely different assumptions for example when we assume the values of $a_3$ and $a_8$ by fixing the parameters of the fitted parton distributions (normalisation constants) and with the assumption of $SU(3)$ symmetry for quark sea we get (using completely different parametrisation from that we use for polarised parton densities):

$$\Delta u_v - \Delta d_v = 1.26,$$
$$\Delta u_v + \Delta d_v = 0.58$$  \hspace{1cm} (7)

If follows that $\Delta u_v = 0.92, \Delta d_v = -0.34$ and in order to get $\Delta \Sigma = 0.20$ we get $2\Delta \bar{u} = 2\Delta \bar{d} = 2\Delta \bar{s} = -0.13$ and that means $\Delta u = 0.79, \delta d = -0.47$ (the values not very different from our values). In such models sea contribution is relatively big and negative contrary to our model where we have at least in the measured region big and positive sea contribution. This type of splitting into big valence and relatively big negative sea contribution is caused by the assumptions of the model. We have not made such assumptions taking $a_8$ as additional experimental point. Our solution with relatively small valence contribution and relatively large positive sea contributions is different but the values of $\Delta u$ and $\Delta d$ in both models are very close. It seems that our assumptions are less restrictive. The fact that we can get completely different splitting into valence and sea contributions using the same experimental data shows that this splitting is not well determined by experimental data what is more reliable are distributions of $\Delta u$ and $\Delta d$ and their integrated values.
We have made fits to data on polarised structure functions on proton, neutron and deuteron targets and we have determined polarised parton distributions. These fits are compared with our previous fits for corresponding asymmetries (improved by usage of recent data from E155 proton experiment in SLAC). As a check we also have made fits to spin asymmetries for all (non averaged in $Q^2$) data on spin asymmetries. These fits lead to very similar results with small integrated gluon contribution. The fits were made without inclusion of information on $a_3$ and $a_8$ from hyperon decays and then repeated with additional experimental point on $a_8$. In the first case $a_8$ is close to zero and $\Delta s$ is positive. In the second case additional experimental point on $a_8$ changes practically only parameters of strange quark and causes small shifts in other parameters. The value of $a_3$ at least in the measured region of $x$ without any assumptions comes out very close to experimental value. It seems that with the parametrisation used by us only $\Delta u(x)$ and $\Delta d(x)$ are well determined (not the splitting into valence and sea parts). Polarised strange quark distributions, gluon distributions and also $\bar{u} - \bar{d}$ splitting are not well determined by polarised deep inelastic experimental data.
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