Radiative Corrections

DSSV Polarized Spin Structure Model

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Outline

Radiative Corrections

- Compute Born asymmetries using polarized cross section differences
- Obtain unpolarized cross sections from F1F209 and asymmetries from polarized structure functions
- In order to carry out radiative corrections on the asymmetries we need to provide input spectrum that fills our phase space into RADCOR.

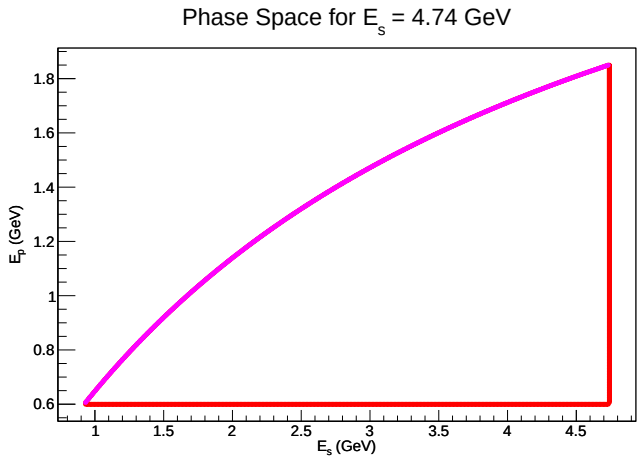


Figure: E06-014 4.74 GeV phase space of incident scattering energy (E_s) vs scattering energy (E_p). RADCOR evaluates the double integral over E_s and E_p.

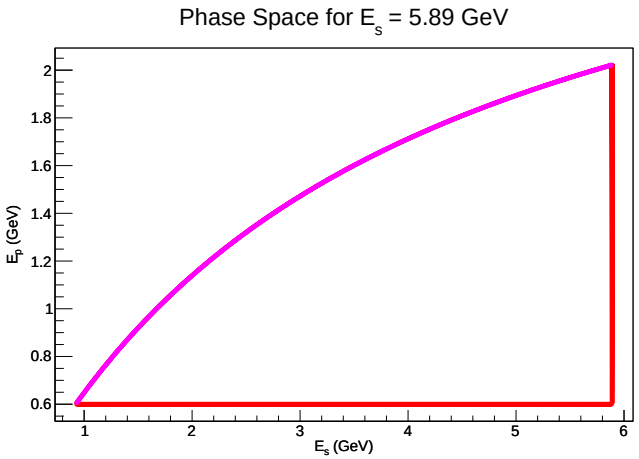


Figure: E06-014 5.89 GeV phase space of incident scattering energy (E_s) vs scattering energy (E_p). RADCOR evaluates the double integral over E_s and E_p.

- Model is needed to fill in our phase space

DSSV

We can use DSSV global fit to DIS,lepton-nucleon and proton-proton scattering to construct polarized structure functions

- DSSV fit done by: Daniel de Florian, Rodolfo Sasso, Marco Stratmann and Werner Vogelsang
- Makes fits to a broad range of experiments
- Relatively recent (2009)
- See arXiv:0904.3821v2[hep-ph], Phys.Rev.Lett.101.:072001,2008
- Returns polarized parton densities $\left(\Delta u, \Delta\overline{u}, \Delta d, \Delta\overline{d}, \Delta s = \Delta\overline{s}, \Delta g\right)$

DSSV: Included DIS Fits

Experiment	Process	N_{data}	χ^2
EMC	DIS(p)	10	3.9
SMC	DIS(p)	12	3.4
SMC	DIS(d)	12	18.4
COMPASS	DIS(d)	15	8.1
E142	DIS(n)	8	5.6
E143	DIS(p)	28	19.3
E143	DIS(d)	28	40.8
E154	DIS(n)	11	4.5
E155	DIS(p)	24	22.6
E155	DIS(d)	24	17.1
HERMES	DIS(He)	9	6.3
HERMES	DIS(p)	15	10.5
HERMES	DIS(d)	15	16.9
HALL A	DIS(n)	3	0.2
CLAS	DIS(p)	10	5.9
CLAS	DIS(d)	10	2.5

Table: DIS experiments that were included in NLO global analysis of polarized parton densities.

E06-014 DSSV Polarized Parton Distributions

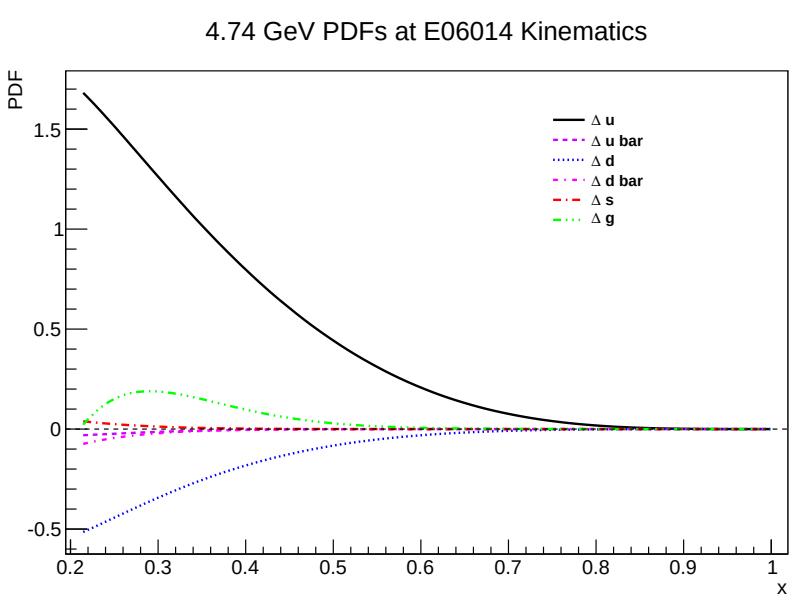


Figure: 4.74 GeV polarized parton distributions from DSSV fits.

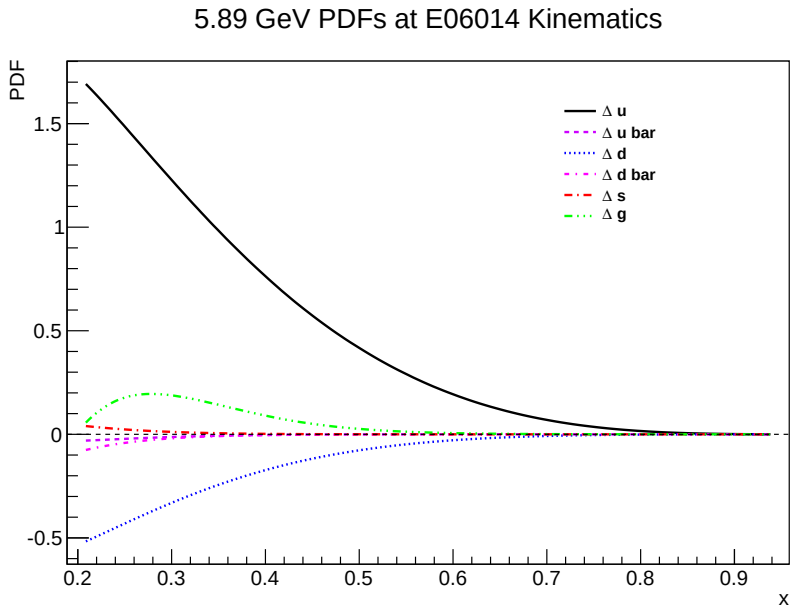


Figure: 5.89 GeV polarized parton distributions from DSSV fits.

Building g_1 Structure Function

$$g_1^{p,(n)} = \frac{1}{2}\sum_i e_i^2 \Delta q_i \tag{1}$$

$$= \frac{1}{2}\left[\frac{4}{9}\left(\frac{1}{9}\right)(\Delta u + \Delta\overline{u}) + \frac{1}{9}\left(\frac{4}{9}\right)\left(\Delta d + \Delta\overline{d}\right) + \frac{1}{9}(2\Delta s)\right] \tag{2}$$

$$g_1^d = \frac{1}{2}\left(1 - \omega_D\right)\left(g_1^p + g_1^n\right) \tag{3}$$

$$g_1^{^3He} = \frac{1}{2}\left(P_n + 0.056\right) g_1^n + \left(2P_p - 0.014\right) g_1^p \tag{4}$$

- ω_D = 0.058 (D-wave stat probability)
- P_n = 0.879, P_p = -0.021 (neutron and proton effective polarizations)
- Factors appearing with polarizations result from the off-shellness of the nucleons.

DSSV g_1^n and $g_1^{^3He}$ Compared to E142

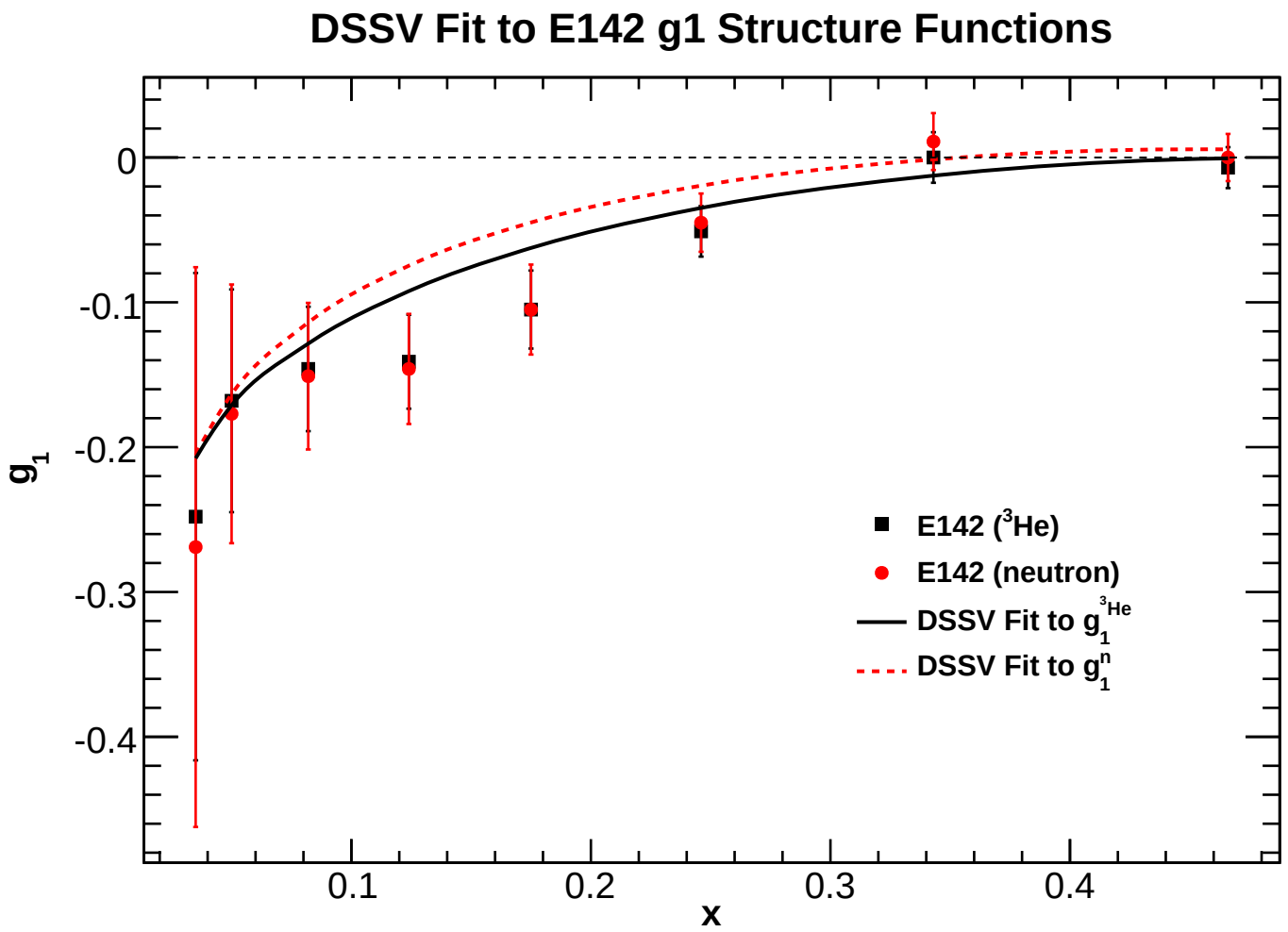


Figure: g_1^n and g_1^{3He} built from DSSV fits at E142 kinematics compared to E142 data.

DSSV g_1 Structure Functions at E06-014 Kinematics

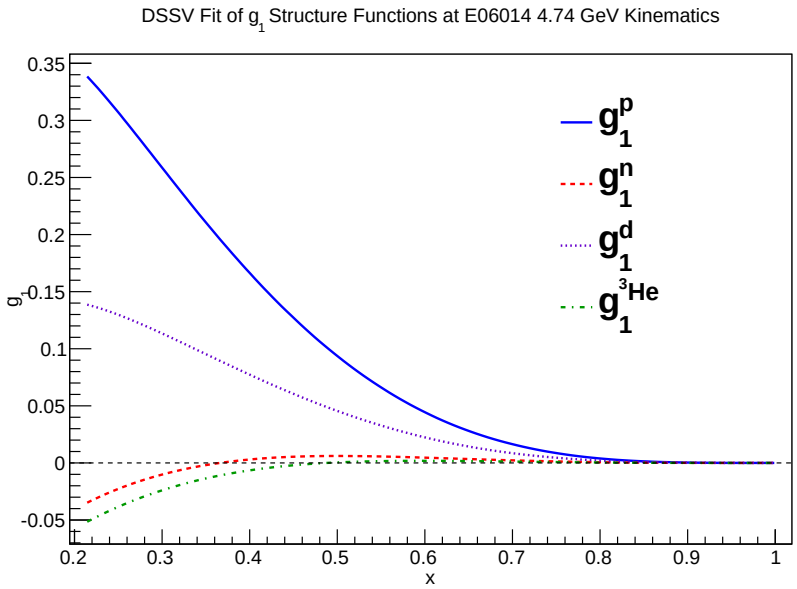


Figure: g_1 structure functions built from DSSV at E06-014 4.74 GeV kinematics.

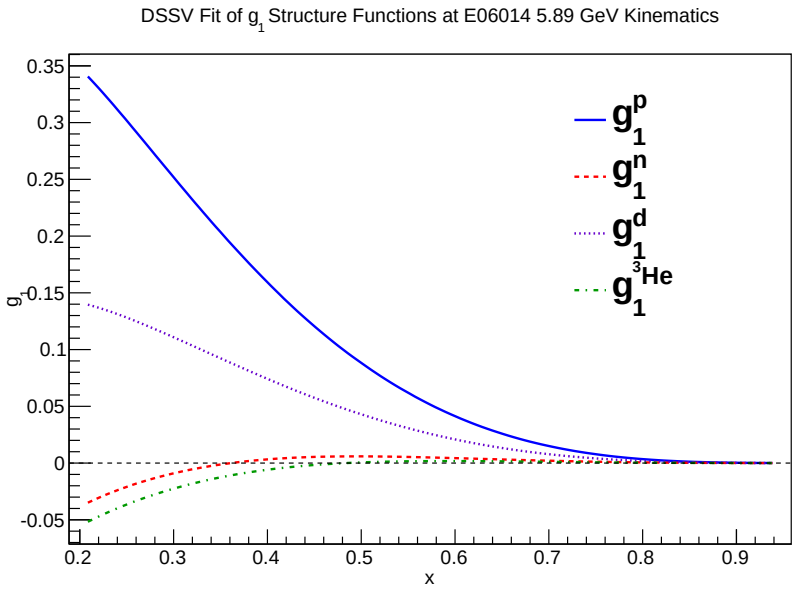


Figure: g_1 structure functions built from DSSV at E06-014 5.89 GeV kinematics.

DSSV g_1^{3He} at E06-014 kinematics

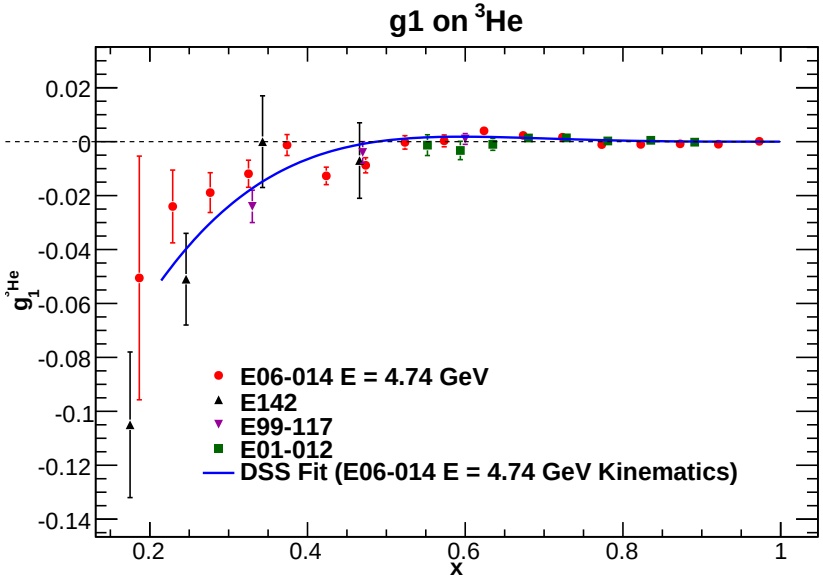
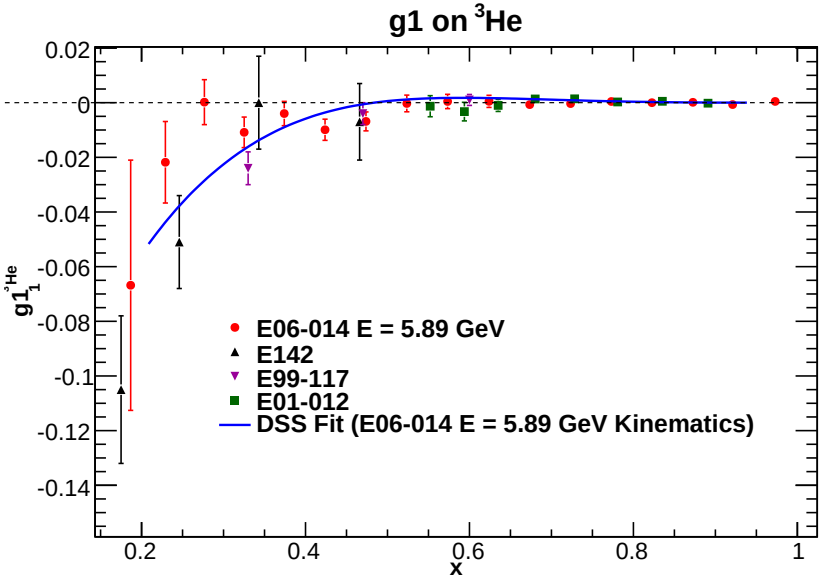


Figure: g_1^{3He} structure functions built from DSSV at E06-014 4.74 GeV kinematics. Also shown is g_1^{3He} from E06-014 (preliminary) at 4.74 GeV and other experiments.



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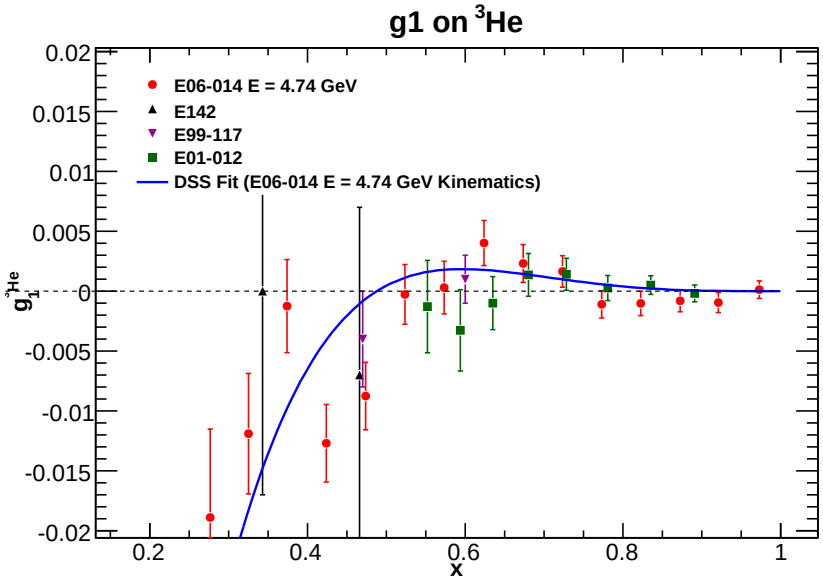
DSSV g_1^{3He} at E06-014 kinematics (Zoomed)



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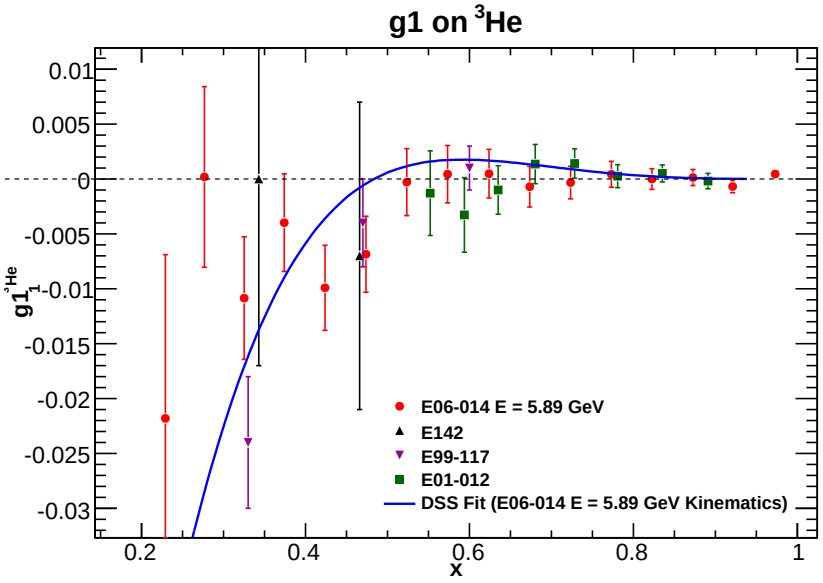

Figure: g_1^{3He} structure functions built from DSSV at E06-014 5.89 GeV kinematics. Also shown is g_1^{3He} from E06-014 (preliminary) at 5.89 GeV and other experiments.

DSSV: Summary

- DSSV fits seem to do a decent job at our kinematics
- Need to build A_1 and look into forming g_2 and A_2
- Use F1F209 and DSSV to form A_1