Synopsis for extractions of unpolarized TMDs: SV19

Alexey A. Vladimirov

These notes contains some information on TMD distributions extracted in the fit SV19, and its later updates. The collection is not complete!, and mainly concernce the latest updates.

Required `artemide` version: >2.04

For the detailed description of the non-perturbative model see sec.2 of reference. NP RAD (2.88):

$$\mathcal{D}(b,\mu) = \mathcal{D}_{\text{resum}}(b^*(b),\mu) + c_0 b b^*(b), \qquad b^*(b) = \frac{b}{\sqrt{1 + \frac{b^2}{B_{\text{NP}}^2}}}. \tag{0.1}$$

NP part of unpolarized TMDPDF:

$$f_{NP}(x,b) = \exp\left(-\frac{\lambda_1 \bar{x} + \lambda_2 x + x\bar{x}\lambda_5}{\sqrt{1 + \lambda_3 x^{\lambda_4} \boldsymbol{b}^2}} \boldsymbol{b}^2\right). \tag{0.2}$$

NP part of unpolarized TMDFF:

$$D_{NP}(z,b) = \exp\left(-\frac{\eta_1 z + \eta_2 \bar{z}}{\sqrt{1 + \eta_3 (\boldsymbol{b}/z)^2}} \frac{\boldsymbol{b}^2}{z^2}\right)\left(1 + \eta_4 \frac{\boldsymbol{b}^2}{z^2}\right). \tag{0.3}$$

I. SV19_NNLO_M=0

Fit: DY+SIDIS (457+582=1039 points)
Perturbative order: NNLO
Number of replicas: 300
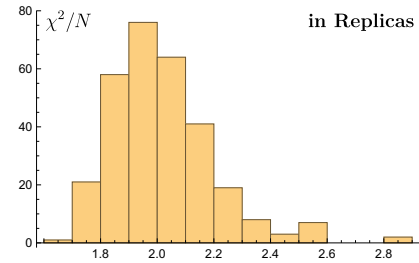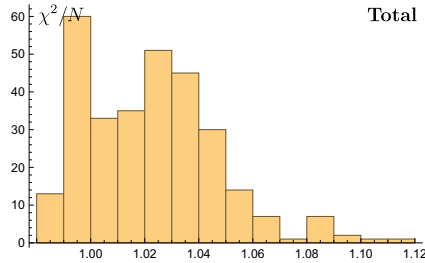**Constants-file:** const-DY+SIDIS_NNPDF31+DSS_nnlo_m=0
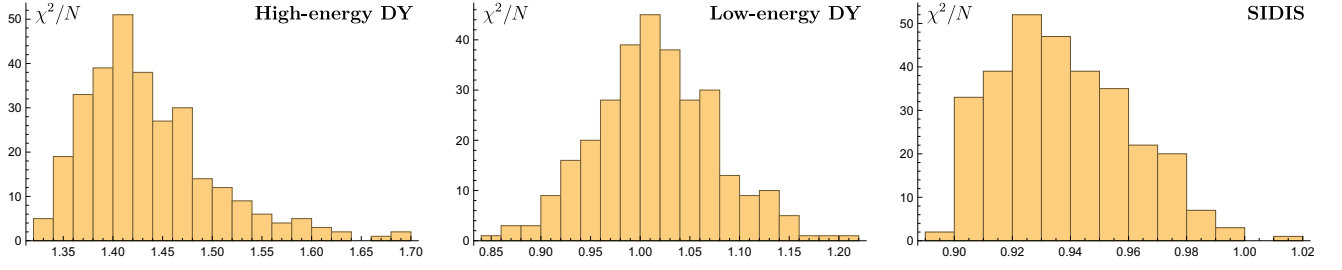**Replica-file:** SV19_nnlo_m=0.rep
Distinctive feature: Target and production mass corrections in SIDIS kinematics are neglected.
Additional restrictions: Parameter fixed: $B_{NP} = 2$GeV.

name	N	chiL^2/N	chiD^2/N	chi^2/N	sys.shift%
CDF1	33	0.538	0.100	0.639	7.095
CDF2	39	1.335	0.001	1.336	1.334
D01	16	0.762	0.005	0.768	-1.287
D02	8	1.437	0.000	1.437	0.000
D02m	3	0.421	0.300	0.721	0.293
A7-00y10	5	1.452	0.002	1.454	-0.036
A7-10y20	5	5.522	0.011	5.533	-0.085
A7-20y24	5	1.367	0.000	1.367	-0.010
A8-00y04	5	2.397	0.099	2.496	2.019
A8-04y08	5	2.586	0.464	3.050	2.018
A8-08y12	5	0.826	0.300	1.126	2.164
A8-12y16	5	1.515	0.268	1.782	2.750
A8-16y20	5	0.765	0.287	1.052	3.456
A8-20y24	5	1.716	0.908	2.624	4.143
A8-46Q66	3	0.243	0.085	0.328	-0.265
A8-116Q150	7	0.750	0.031	0.781	0.278
CMS7	8	1.248	0.000	1.248	0.000
CMS8	8	0.772	0.000	0.772	0.000
LHCb7	8	1.612	0.569	2.181	4.535
LHCb8	7	2.773	1.052	3.825	4.453
LHCb13	9	0.607	0.185	0.792	5.044
PHE200	3	0.284	0.000	0.284	-0.250
E228-200	43	1.034	0.043	1.077	33.958
E228-300	53	1.005	0.025	1.029	28.507
E228-400	76	0.834	0.008	0.842	19.414
E772	35	1.895	0.015	1.910	7.230
E605	53	0.513	0.034	0.547	20.057
Total	457	1.096	0.079	1.175	

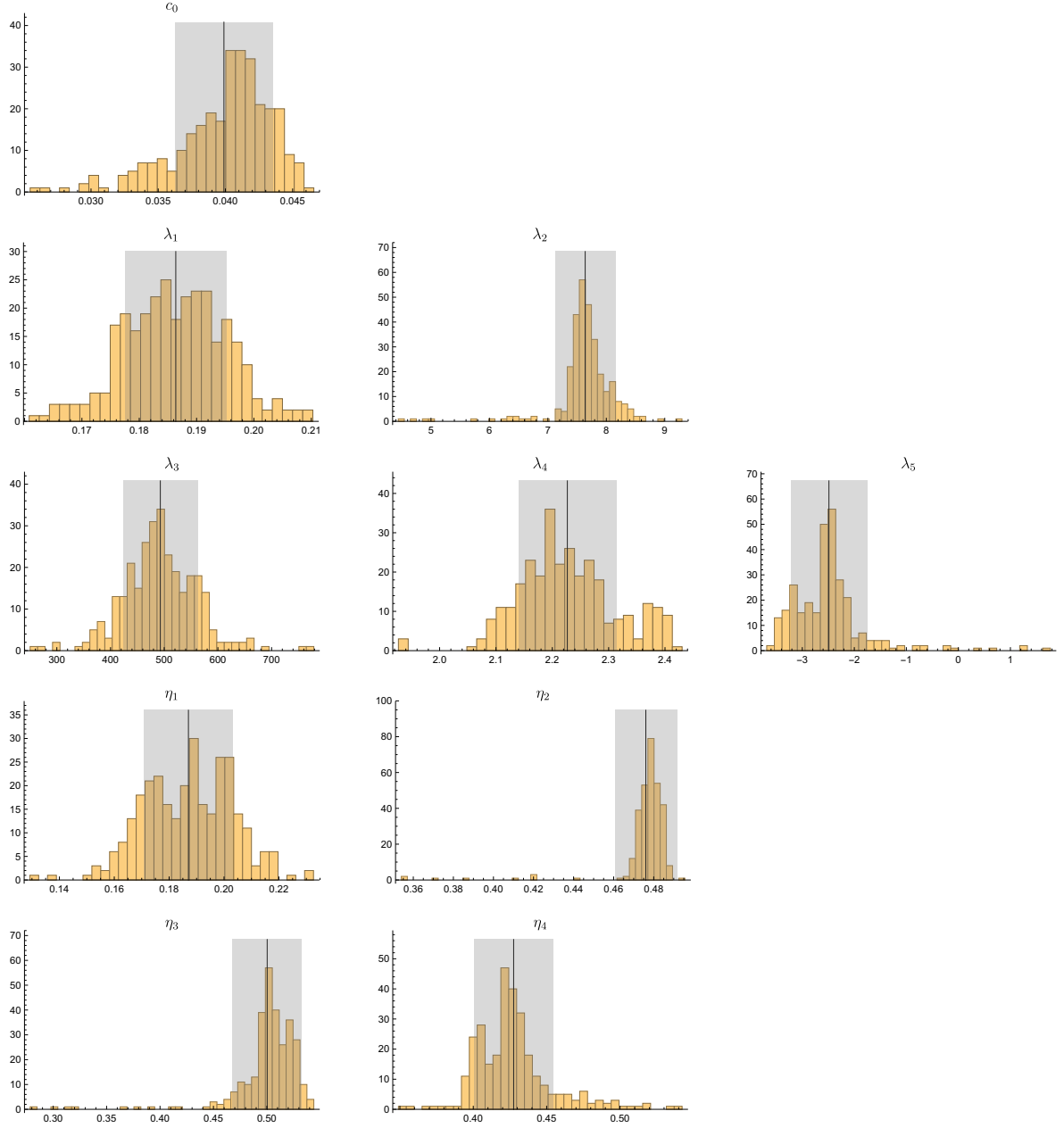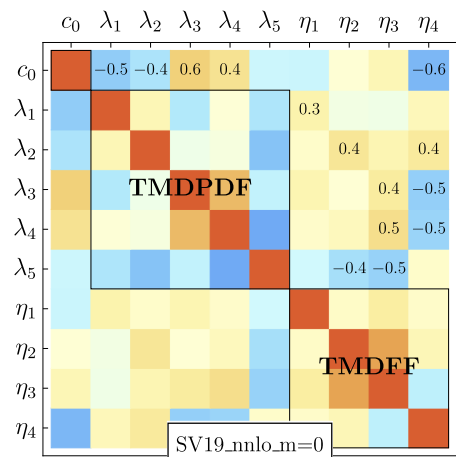| name	N	chiL^2/N	chiD^2/N	chi^2/N	sys.shift%
hermes.p.vmsub.zxpt.pi+	24	2.371	0.237	2.607	1.983
hermes.p.vmsub.zxpt.pi-	24	1.277	0.044	1.321	0.853
hermes.d.vmsub.zxpt.pi+	24	0.680	0.023	0.703	0.683
hermes.d.vmsub.zxpt.pi-	24	0.880	0.029	0.909	0.772
hermes.p.vmsub.zxpt.k+	24	0.630	0.000	0.630	-0.039
hermes.p.vmsub.zxpt.k-	24	0.627	0.000	0.627	0.061
hermes.d.vmsub.zxpt.k+	24	0.474	0.000	0.474	0.038
hermes.d.vmsub.zxpt.k-	24	1.214	0.001	1.215	0.159
compass.d.h+	195	0.686	0.005	0.691	1.148
compass.d.h-	195	0.817	0.064	0.881	-4.102
Total	582	0.840	0.037	0.877	

Parameter vectors:

$$\mathbf{Mean} \ = \ \{2., 0.0399, 0.186, 7.64, 492., 2.23, -2.49, 0., 0., 0.187, 0.476, 0.500, 0.428\} \tag{1.1}$$

$$\mathbf{std} \ = \ \{0., 0.0036, 0.0088, 0.52, 70., 0.087, 0.74, 0., 0., 0.016, 0.015, 0.032, 0.027\} \tag{1.2}$$

Distribution of parameters over replicas

	c_0	λ_1	λ_2	λ_3	λ_4	λ_5	η_1	η_2	η_3	η_4
c_0		−0.5	−0.4	0.6	0.4					−0.6
λ_1							0.3			
λ_2								0.4		0.4
λ_3			**TMDPDF**						0.4	−0.5
λ_4									0.5	−0.5
λ_5								−0.4	−0.5	
η_1										
η_2								**TMDFF**		
η_3										
η_4						SV19_nnlo_m=0				

II.   SV19_NNLO_ALL=0

Fit: DY+SIDIS (457+582=1039 points)
Perturbative order: NNLO
Number of replicas: 300
**Constants-file:** const-DY+SIDIS_NNPDF31+DSS_nnlo_all=0
**Replica-file:** SV19_nnlo_all=0.rep
Distinctive feature: Target and production mass corrections in SIDIS kinematics are neglected; q_T corrections in kinematics are neglected.
Additional restrictions: Parameter fixed: $B_{NP} = 2\text{GeV}$.

```
name         |   N   |  chiL^2/N  |  chiD^2/N  |  chi^2/N   | sys.shift% |
-------------|-------|------------|------------|------------|------------|-
CDF1         |  33   |   0.463    |   0.065    |   0.529    |    5.724   |
CDF2         |  39   |   0.771    |   0.000    |   0.771    |   -0.091   |
D01          |  16   |   0.502    |   0.025    |   0.527    |   -2.790   |
D02          |   8   |   0.725    |   0.000    |   0.725    |    0.000   |
D02m         |   3   |   0.080    |   0.297    |   0.378    |    0.308   |
A7-00y10     |   5   |   4.477    |   0.005    |   4.483    |   -0.057   |
A7-10y20     |   5   |   7.977    |   0.007    |   7.984    |   -0.066   |
A7-20y24     |   5   |   1.737    |   0.000    |   1.737    |    0.012   |
A8-00y04     |   5   |   1.960    |   0.056    |   2.016    |    1.442   |
A8-04y08     |   5   |   4.798    |   0.556    |   5.355    |    1.444   |
A8-08y12     |   5   |   2.865    |   0.281    |   3.146    |    1.581   |
A8-12y16     |   5   |   1.795    |   0.177    |   1.973    |    2.062   |
A8-16y20     |   5   |   1.520    |   0.198    |   1.717    |    2.763   |
A8-20y24     |   5   |   1.460    |   0.618    |   2.078    |    3.344   |
A8-46Q66     |   3   |   0.539    |   0.184    |   0.724    |   -1.055   |
A8-116Q150   |   7   |   0.704    |   0.027    |   0.731    |   -0.406   |
CMS7         |   8   |   1.746    |   0.000    |   1.746    |    0.000   |
CMS8         |   8   |   0.918    |   0.000    |   0.918    |    0.000   |
LHCb7        |   8   |   1.840    |   0.294    |   2.134    |    3.259   |
LHCb8        |   7   |   2.673    |   0.645    |   3.318    |    3.488   |
LHCb13       |   9   |   0.727    |   0.102    |   0.829    |    3.741   |
PHE200       |   3   |   0.382    |   0.030    |   0.412    |   -5.055   |
E228-200     |  43   |   1.492    |   0.014    |   1.506    |   19.495   |
E228-300     |  53   |   1.409    |   0.007    |   1.416    |   15.134   |
E228-400     |  76   |   1.136    |   0.001    |   1.136    |    5.364   |
E772         |  35   |   2.237    |   0.001    |   2.237    |   -1.508   |
E605         |  53   |   0.562    |   0.010    |   0.572    |   10.936   |
-------------|-------|------------|------------|------------|------------|-
Total        |  457  |   1.323    |   0.051    |   1.374    |
```

```
name                    |   N   |  chiL^2/N  |  chiD^2/N  |  chi^2/N   | sys.shift% |
------------------------|-------|------------|------------|------------|------------|-
hermes.p.vmsub.zxpt.pi+ |  24   |   2.591    |   0.324    |   2.916    |    2.320   |
hermes.p.vmsub.zxpt.pi- |  24   |   1.472    |   0.061    |   1.533    |    1.007   |
hermes.d.vmsub.zxpt.pi+ |  24   |   0.860    |   0.072    |   0.932    |    1.207   |
hermes.d.vmsub.zxpt.pi- |  24   |   1.028    |   0.048    |   1.077    |    0.991   |
hermes.p.vmsub.zxpt.k+  |  24   |   0.607    |   0.000    |   0.607    |   -0.011   |
hermes.p.vmsub.zxpt.k-  |  24   |   0.601    |   0.000    |   0.601    |    0.068   |
hermes.d.vmsub.zxpt.k+  |  24   |   0.427    |   0.000    |   0.427    |    0.074   |
hermes.d.vmsub.zxpt.k-  |  24   |   1.194    |   0.002    |   1.196    |    0.215   |
compass.d.h+            |  195  |   0.851    |   0.022    |   0.872    |    2.377   |
compass.d.h-            |  195  |   0.935    |   0.026    |   0.960    |   -2.589   |
------------------------|-------|------------|------------|------------|------------|-
Total                   |  582  |   0.960    |   0.037    |   0.997    |
```
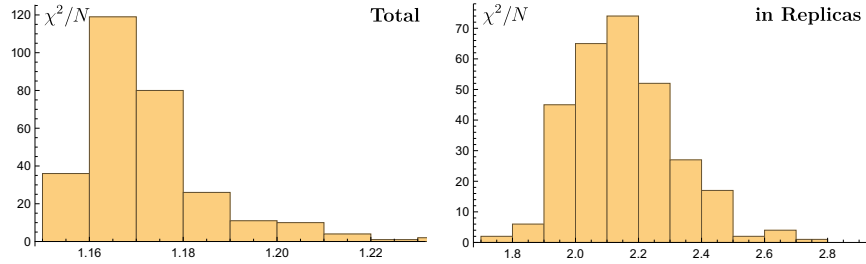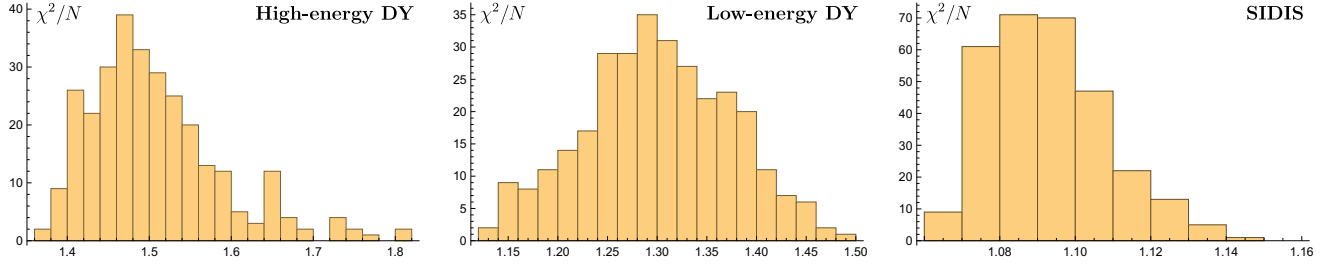
Parameter vectors:

$$\textbf{Mean} \;=\; \{2., 0.0397, 0.185, 6.23, 580., 2.44, -2.53, 0., 0., 0.279, 0.460, 0.436, 0.551\} \tag{2.1}$$

$$\textbf{std} \;=\; \{0., 0.0037, 0.008, 0.45, 78., 0.10, 0.45, 0., 0., 0.013, 0.015, 0.025, 0.027\} \tag{2.2}$$

Distribution of parameters over replicas