Flavor dependent intrinsic kt

- Ola

Intro

HERAPDF conventions (1506.06042) :

the vector and axial-vector weak couplings of the up- and down-type quarks to the Z boson. The terms xU, xD, $x\bar{U}$ and $x\bar{D}$ denote the sums of parton distributions for up-type and down-type quarks and anti-quarks, respectively. Below the b-quark mass threshold, these sums are related to the quark distributions as follows

$$xU = xu + xc\,, \qquad x\bar{U} = x\bar{u} + x\bar{c}\,, \qquad xD = xd + xs\,, \qquad x\bar{D} = x\bar{d} + x\bar{s}\,, \qquad (5)$$

where xs and xc are the strange- and charm-quark distributions. Assuming symmetry between the quarks and anti-quarks in the sea, the valence-quark distributions can be expressed as

$$xu_v = xU - x\bar{U}\,, \qquad xd_v = xD - x\bar{D}\,. \qquad (6)$$

if $xs = x\bar{s}$, $xc = x\bar{c}$, $xb = x\bar{b}$:

then:

$xdv = xD - x\bar{D} = xd + xs - x\bar{d} - x\bar{s} = xd - x\bar{d}$

$xuv = xU - x\bar{U} = xu + xc - x\bar{u} - x\bar{c} = xu - x\bar{u}$

No reason for this being not fulfilled: $xc = x\bar{c}$, $xb = x\bar{b}$

I think I can have $xs = x\bar{s}$ at the collinear level but not at the tmd level.

updfevolv conventions :

```
if(iparton.eq.1) then
      sum = DNV+DSEA                          → d-quark (xd)

      elseif(iparton.eq.-1) then
      sum = DSEA                              → xdbar

      elseif(iparton.eq.2) then
      sum = UPV+USEA                          → u-quark (xu)

      elseif(iparton.eq.-2) then
      sum = USEA                              → xubar

      elseif(iabs(iparton).eq.3) then
      sum = STR                               → xs I xsbar

      elseif(iparton.eq.0) then
      sum = GLU                               → xg
```

updfevolv evolves u, ubar, d, dbar, s, sbar, c, cbar, b, bbar.

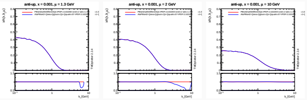
sea = u+d+s

Summary Scenario 1:

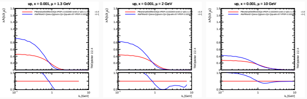
Summary Scenario 1:

qs=1.0 iparton = -1, -2, -3, 0
qs=0.7 iparton = 1,2,3

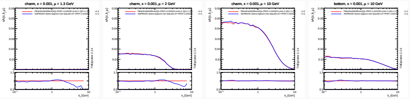
Comparison with PBset2 with qs=1:



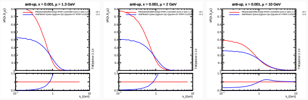
analogous gluon, anti-down, anti-strange, sea



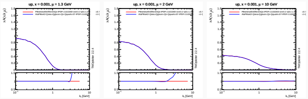
analogous down, strange,up-val, down-val.



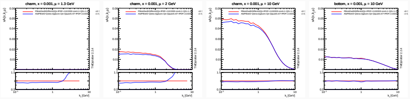
Comparison with PBset2 with qs=0.7:



analogous gluon, anti-down, anti-strange, sea,



analogous down, strange, up-val, down-val.

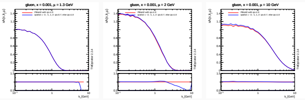


Summary Scenario 2:

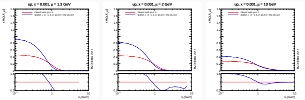
Summary Scenario 2:

qs=1.0 iparton = -3, 3, 0
qs=0.7 iparton = -2, -1, 1, 2

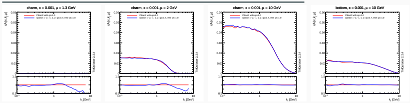
Comparison with PBset2 with qs=1:



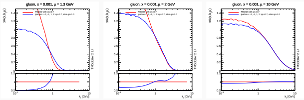
analogous strange and antistrange



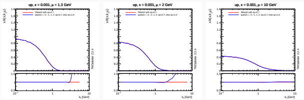
analogous down, ubar, dbar, sea



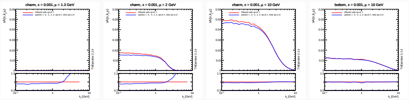
Comparison with PBset2 with qs=0.7:



analogous strange and antistrange



analogous down, ubar, dbar, sea

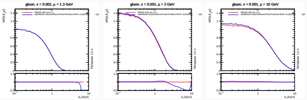


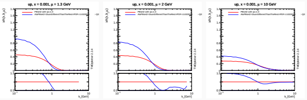
Summary Scenario 3:

Summary Scenario 3:

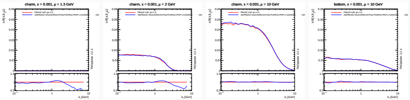
qs=1.0 iparton = 0
qs=0.7 iparton = -3,-2, -1, 1, 2,3

Comparison with PBset2 with qs=1:

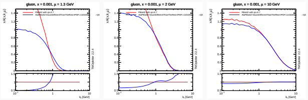


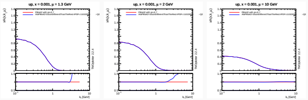


analogous down, ubar, dbar, ,s,sbra, valence, sea

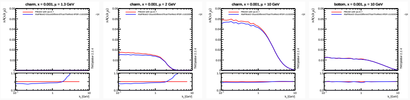


Comparison with PBset2 with qs=0.7:





analogous down, ubar, dbar,s, sbar, valence, sea

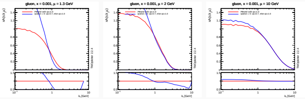


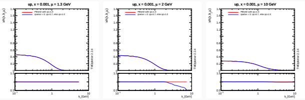
Summary Scenario 4:

Summary Scenario 4:

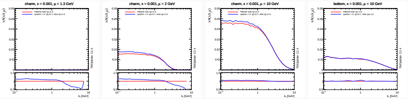
qs=0.7 iparton = 0
qs=1.0 iparton = -3,-2, -1, 1, 2,3

Comparison with PBset2 with qs=1:

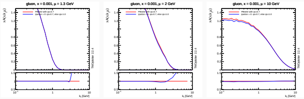


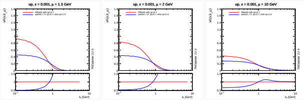


analogous down, ubar, dbar, ,s,sbra, valence, sea

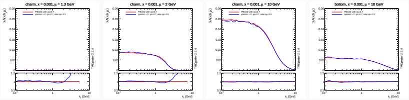


Comparison with PBset2 with qs=0.7:





analogous down, ubar, dbar,s, sbar, valence, sea



DY 13 TeV

DY 13 TeV

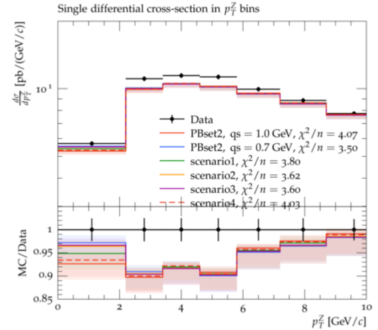
scenario 1:
qs=1.0 : iparton = -1, -2, -3, 0 (dbar, ubar, sbar, gluon)
qs=0.7: iparton = 1,2,3 (u,d,s)

scenario 2:
iparton = -2, -1, 1, 2 : qs= 0.7 (u, ubar, d, dbar)
else: qs = 1.0 (s, sar, gluon)

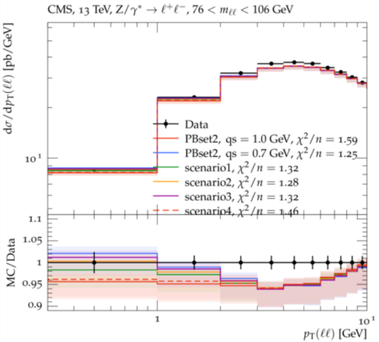
scenario 3:
iparton = -3,-2, -1, 1, 2,3 : qs= 0.7 (u, ubar, d, dbar, s, sbar)
else: qs = 1.0 (gluon)

scenario 4:
iparton = 0: qs=0.7 (gluon)
iparton = -3,-2, -1, 1, 2,3: qs=1.0 (u, ubar, d, dbar, s, sbar)

LHCb

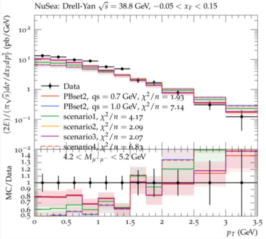


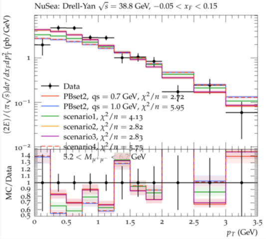
CMS

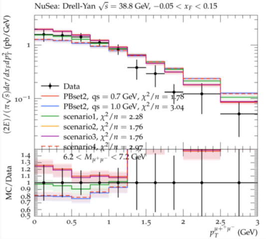


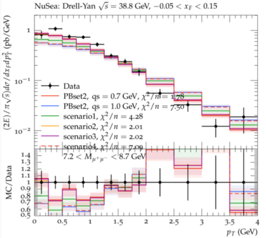
DY NUSEA

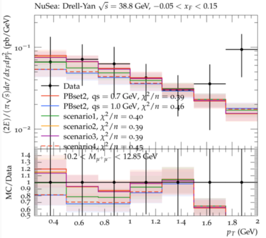
NUSEA


NuSea: Drell-Yan $\sqrt{s} = 38.8$ GeV, $-0.05 < x_F < 0.15$
$(2E)/(\pi\sqrt{s})d\sigma/dx_F dp_T^2$ (pb/GeV)
Data
PBset2, qs = 0.7 GeV, $\chi^2/n = 1.93$
PBset2, qs = 1.0 GeV, $\chi^2/n = 7.14$
scenario1, $\chi^2/n = 4.17$
scenario2, $\chi^2/n = 2.09$
scenario3, $\chi^2/n = 2.07$
scenario4, $\chi^2/n = 6.83$
$4.2 < M_{\mu^+\mu^-} < 5.2$ GeV
MC/Data
p_T (GeV)


NuSea: Drell-Yan $\sqrt{s} = 38.8$ GeV, $-0.05 < x_F < 0.15$
$(2E)/(\pi\sqrt{s})d\sigma/dx_F dp_T^2$ (pb/GeV)
Data
PBset2, qs = 0.7 GeV, $\chi^2/n = 2.72$
PBset2, qs = 1.0 GeV, $\chi^2/n = 5.95$
scenario1, $\chi^2/n = 4.13$
scenario2, $\chi^2/n = 2.82$
scenario3, $\chi^2/n = 2.83$
scenario4, $\chi^2/n = 5.75$
$5.2 < M_{\mu^+\mu^-} < 6.2$ GeV
MC/Data
p_T (GeV)

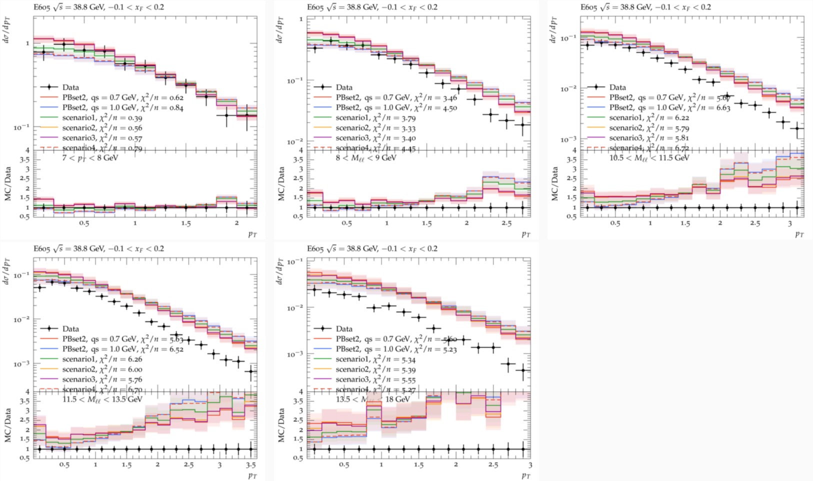

NuSea: Drell-Yan $\sqrt{s} = 38.8$ GeV, $-0.05 < x_F < 0.15$
$(2E)/(\pi\sqrt{s})d\sigma/dx_F dp_T^2$ (pb/GeV)
Data
PBset2, qs = 0.7 GeV, $\chi^2/n = 1.78$
PBset2, qs = 1.0 GeV, $\chi^2/n = 3.04$
scenario1, $\chi^2/n = 2.28$
scenario2, $\chi^2/n = 1.76$
scenario3, $\chi^2/n = 1.76$
scenario4, $\chi^2/n = 2.97$
$6.2 < M_{\mu^+\mu^-} < 7.2$ GeV
MC/Data
$p_T^{\mu^+\mu^-}$ (GeV)


NuSea: Drell-Yan $\sqrt{s} = 38.8$ GeV, $-0.05 < x_F < 0.15$
$(2E)/(\pi\sqrt{s})d\sigma/dx_F dp_T^2$ (pb/GeV)
Data
PBset2, qs = 0.7 GeV, $\chi^2/n = 1.78$
PBset2, qs = 1.0 GeV, $\chi^2/n = 7.50$
scenario1, $\chi^2/n = 4.28$
scenario2, $\chi^2/n = 2.01$
scenario3, $\chi^2/n = 2.02$
scenario4, $\chi^2/n = 7.09$
$7.2 < M_{\mu^+\mu^-} < 8.7$ GeV
MC/Data
p_T (GeV)


NuSea: Drell-Yan $\sqrt{s} = 38.8$ GeV, $-0.05 < x_F < 0.15$
$(2E)/(\pi\sqrt{s})d\sigma/dx_F dp_T^2$ (pb/GeV)
Data
PBset2, qs = 0.7 GeV, $\chi^2/n = 0.39$
PBset2, qs = 1.0 GeV, $\chi^2/n = 0.46$
scenario1, $\chi^2/n = 0.40$
scenario2, $\chi^2/n = 0.39$
scenario3, $\chi^2/n = 0.39$
scenario4, $\chi^2/n = 0.45$
$10.2 < M_{\mu^+\mu^-} < 12.85$ GeV
MC/Data
p_T (GeV)

E605

DY E605


E605 $\sqrt{s}$ = 38.8 GeV, −0.1 < x_F < 0.2
Data
PBset2, qs = 0.7 GeV, χ^2/n = 0.62
PBset2, qs = 1.0 GeV, χ^2/n = 0.84
scenario1, χ^2/n = 0.39
scenario2, χ^2/n = 0.56
scenario3, χ^2/n = 0.57
scenario4, χ^2/n = 0.79
7 < p_T < 8 GeV
E605 $\sqrt{s}$ = 38.8 GeV, −0.1 < x_F < 0.2
Data
PBset2, qs = 0.7 GeV, χ^2/n = 3.46
PBset2, qs = 1.0 GeV, χ^2/n = 4.50
scenario1, χ^2/n = 3.79
scenario2, χ^2/n = 3.33
scenario3, χ^2/n = 3.40
scenario4, χ^2/n = 4.45
8 < $M_{\ell\ell}$ < 9 GeV
E605 $\sqrt{s}$ = 38.8 GeV, −0.1 < x_F < 0.2
Data
PBset2, qs = 0.7 GeV, χ^2/n = 5.67
PBset2, qs = 1.0 GeV, χ^2/n = 6.63
scenario1, χ^2/n = 6.22
scenario2, χ^2/n = 5.79
scenario3, χ^2/n = 5.81
scenario4, χ^2/n = 6.72
10.5 < $M_{\ell\ell}$ < 11.5 GeV
E605 $\sqrt{s}$ = 38.8 GeV, −0.1 < x_F < 0.2
Data
PBset2, qs = 0.7 GeV, χ^2/n = 5.63
PBset2, qs = 1.0 GeV, χ^2/n = 6.52
scenario1, χ^2/n = 6.26
scenario2, χ^2/n = 6.00
scenario3, χ^2/n = 5.76
scenario4, χ^2/n = 6.70
11.5 < $M_{\ell\ell}$ < 13.5 GeV
E605 $\sqrt{s}$ = 38.8 GeV, −0.1 < x_F < 0.2
Data
PBset2, qs = 0.7 GeV, χ^2/n = 5.60
PBset2, qs = 1.0 GeV, χ^2/n = 5.23
scenario1, χ^2/n = 5.34
scenario2, χ^2/n = 5.39
scenario3, χ^2/n = 5.55
scenario4, χ^2/n = 5.27
13.5 < $M_{\ell\ell}$ < 18 GeV
$d\sigma/dp_T$
MC/Data
p_T