Weekly Meeting
20250912

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To Do

- **RPC**
  - Test carbon RPC
  - Test discriminator : shaper & delay line unction
  - PCB production
  - Discriminator control code
  - New carbonless RPC

- **DY analysis ：**
  - Test 2*2 matrix

- **ZDC 3rd prototype**
  - **Delay of SiPM order, deliver only next year Jan. ➔ test beam in 2026 April to Sep**
  - **FoCal test beam still takes place next Feb ➔ joint test LYSO + filter + APD + CIROC/H2GCROC**

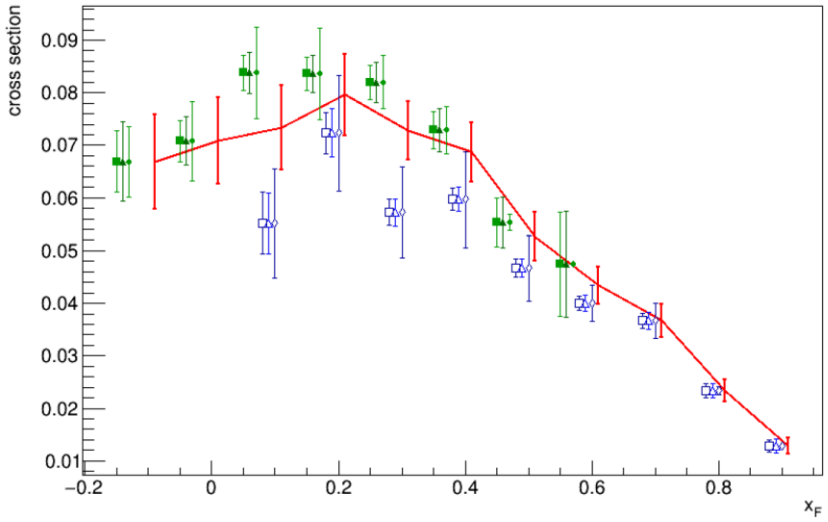
- **ZDC MC simulation (Alan's help)**
  - Try Sampling ZDC ECAL?
  - Energy dump in ZDC HCAL?

- **MCFM + xFitter**

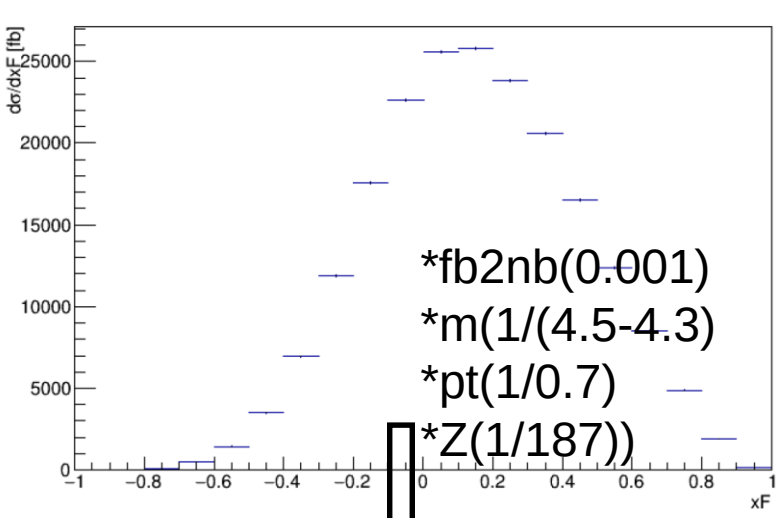
MCFM work (last week)

COMPASS data massL=4.3 massH=4.7 ptL=0.0 ptH=0.7

$$\frac{d^3\sigma}{dx_F\, dq_T\, dM}\left\{\frac{\text{nb GeV}^{-2}\, c^3}{\text{nucleon}}\right\}$$

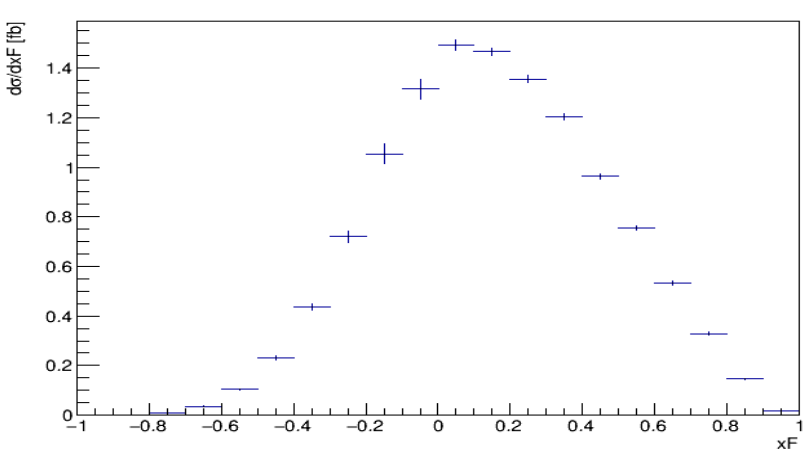


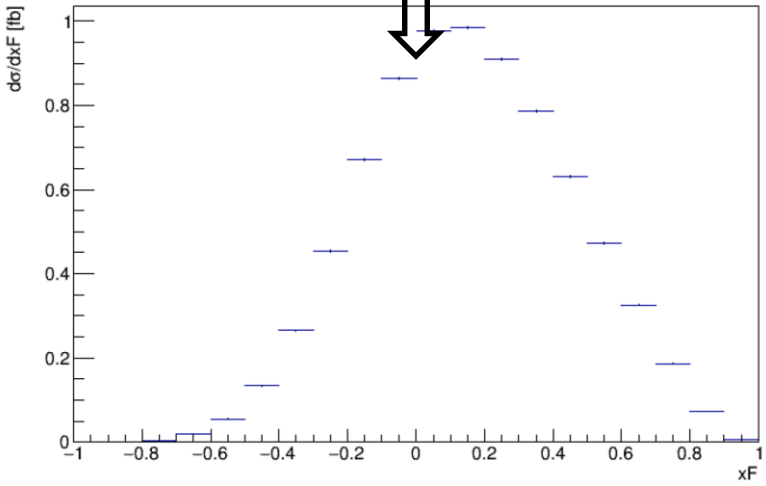
MCFM (mass = [4.3, 4.5], lord)



*fb2nb(0.001)
*m(1/(4.5-4.3)
*pt(1/0.7)
*Z(1/187))

MCFM (mass = [4.3, 4.5], tota)?





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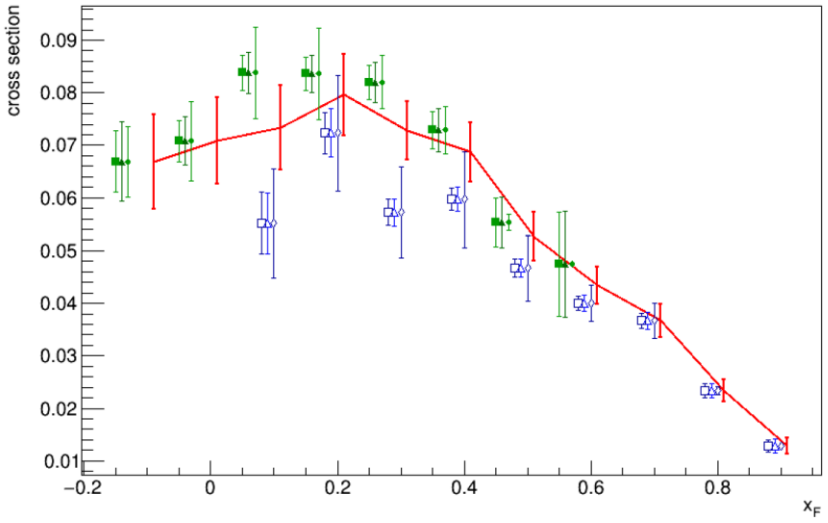
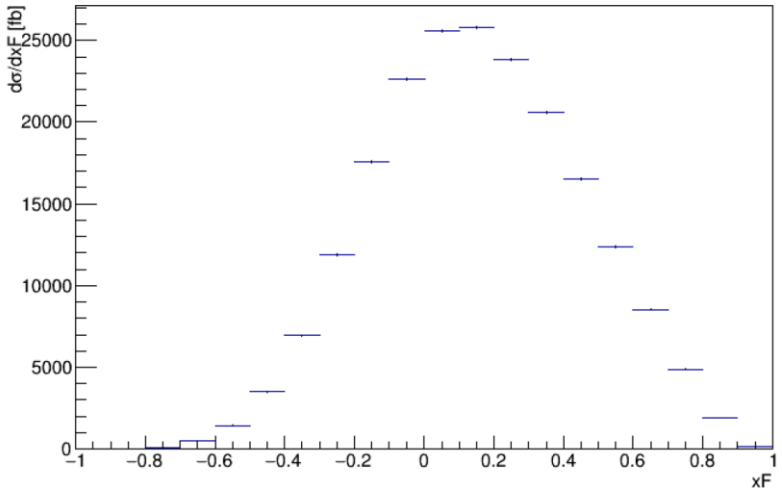
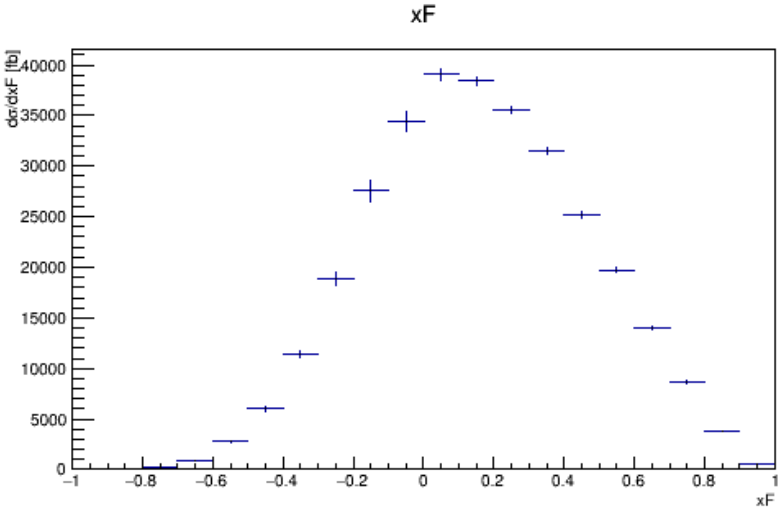


MCFM (mass = [4.3, 4.5], lord)

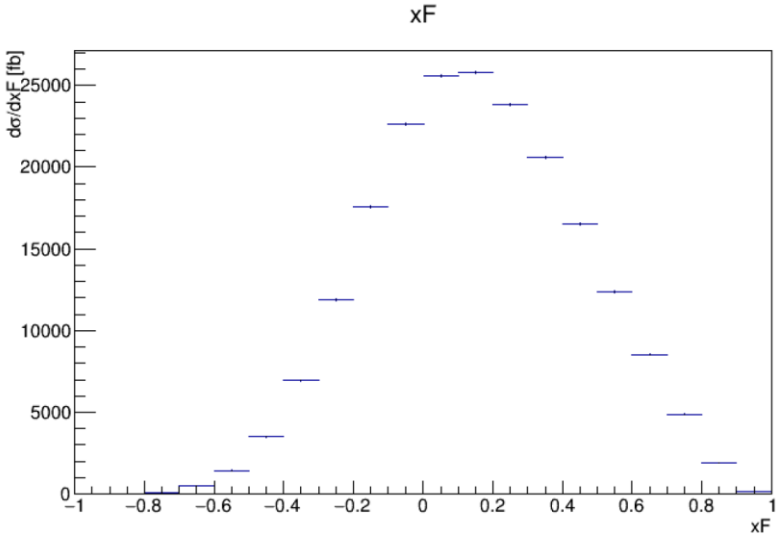


MCFM (mass = [4.3, 4.5], tota)

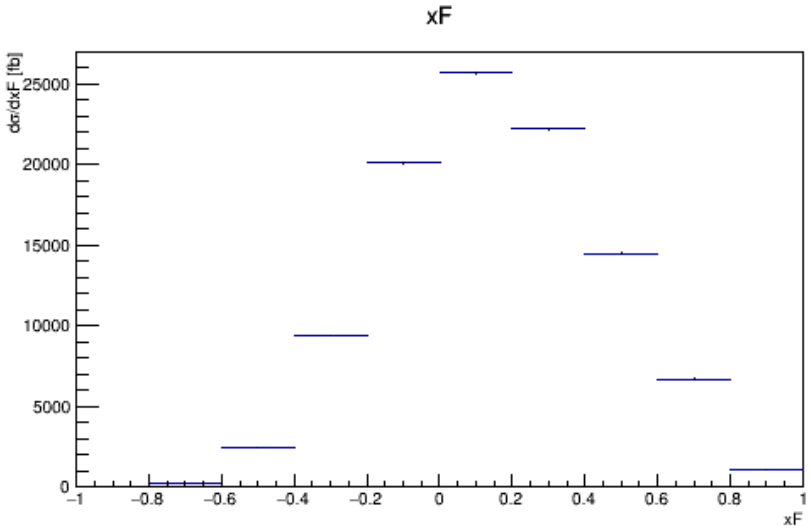


Lord, change xf binning

MCFM (mass = [4.3, 4.5], lord, bin_xf = 0.1)



MCFM (mass = [4.3, 4.5], lord, bin_xf = 0.2)



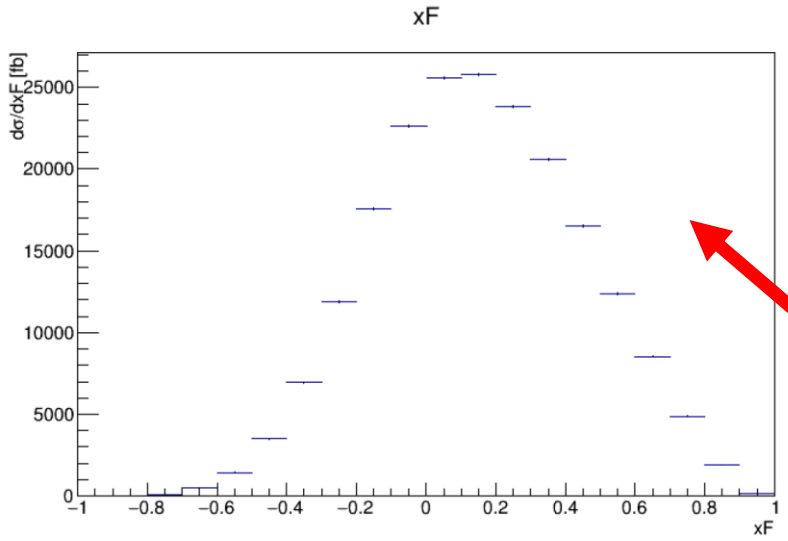
MCFM (mass = [4.3, 4.4], lord, bin_xf = 0.1)

MCFM (mass = [4.4, 4.5], lord, bin_xf = 0.1)

Already divided by xf bin

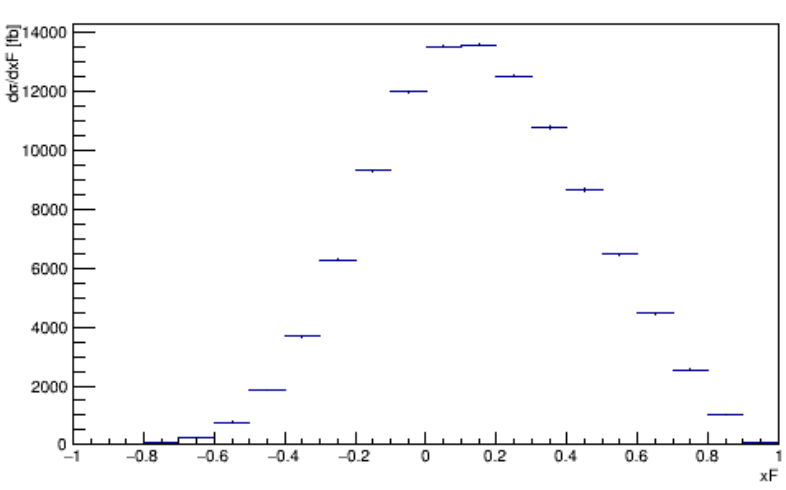
Lord, change mass binning

MCFM (mass = [4.3, 4.5], lord, bin_xf = 0.1)



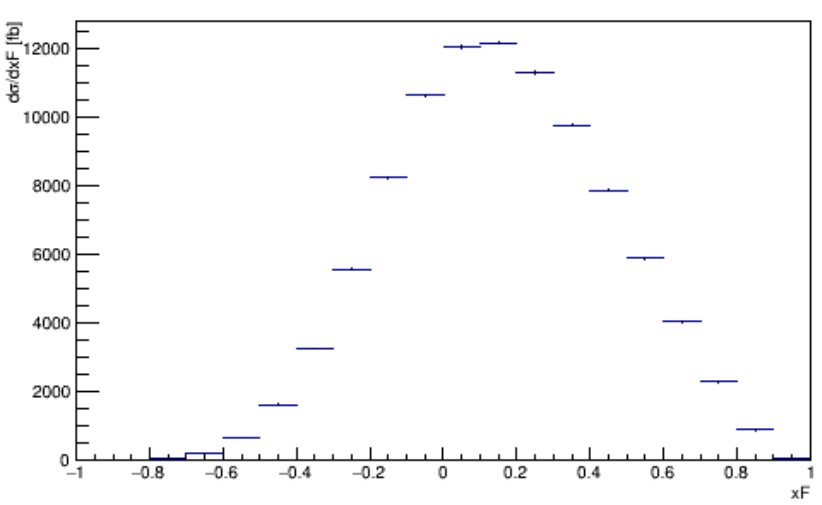
Not divided by mass bin
=> Then not divided by pt bin either

MCFM (mass = [4.3, 4.4], lord, bin_xf = 0.1)



+

MCFM (mass = [4.4, 4.5], lord, bin_xf = 0.1)



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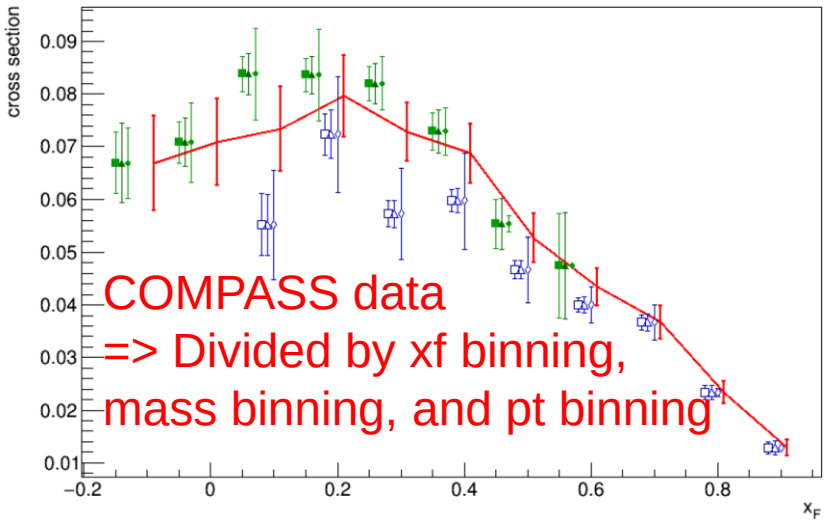
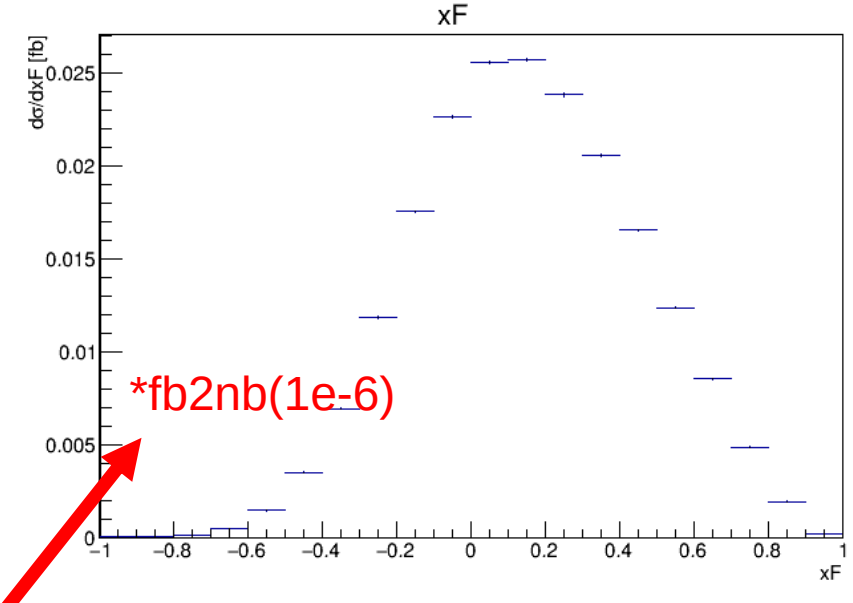
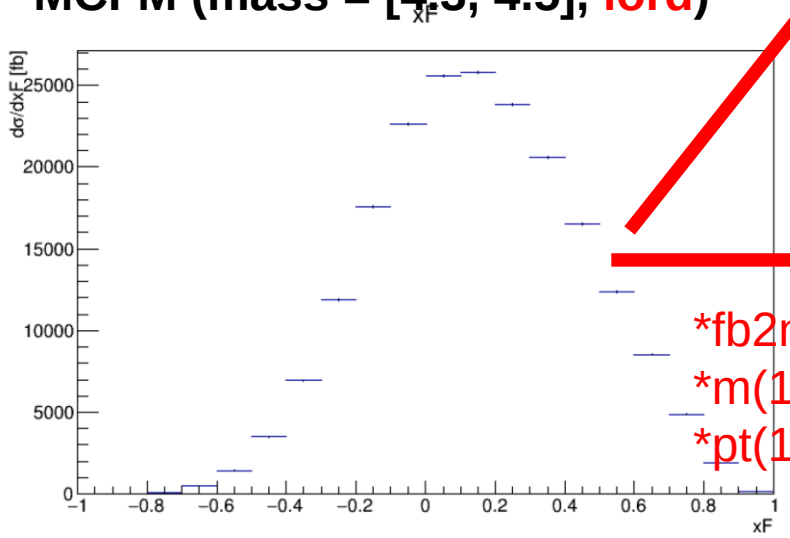
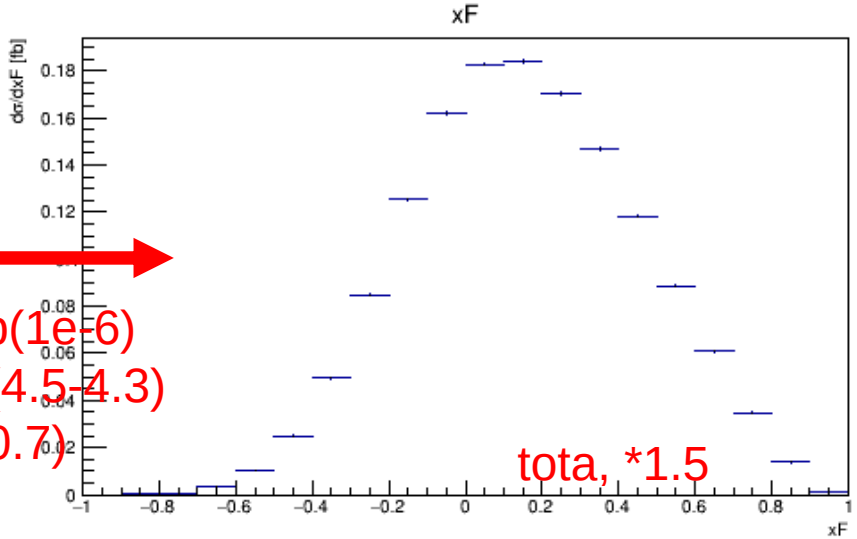
$$\frac{d^3\sigma}{dx_F\, dq_T\, dM}\left\{\frac{\text{nb GeV}^{-2}\, c^3}{\text{nucleon}}\right\}$$



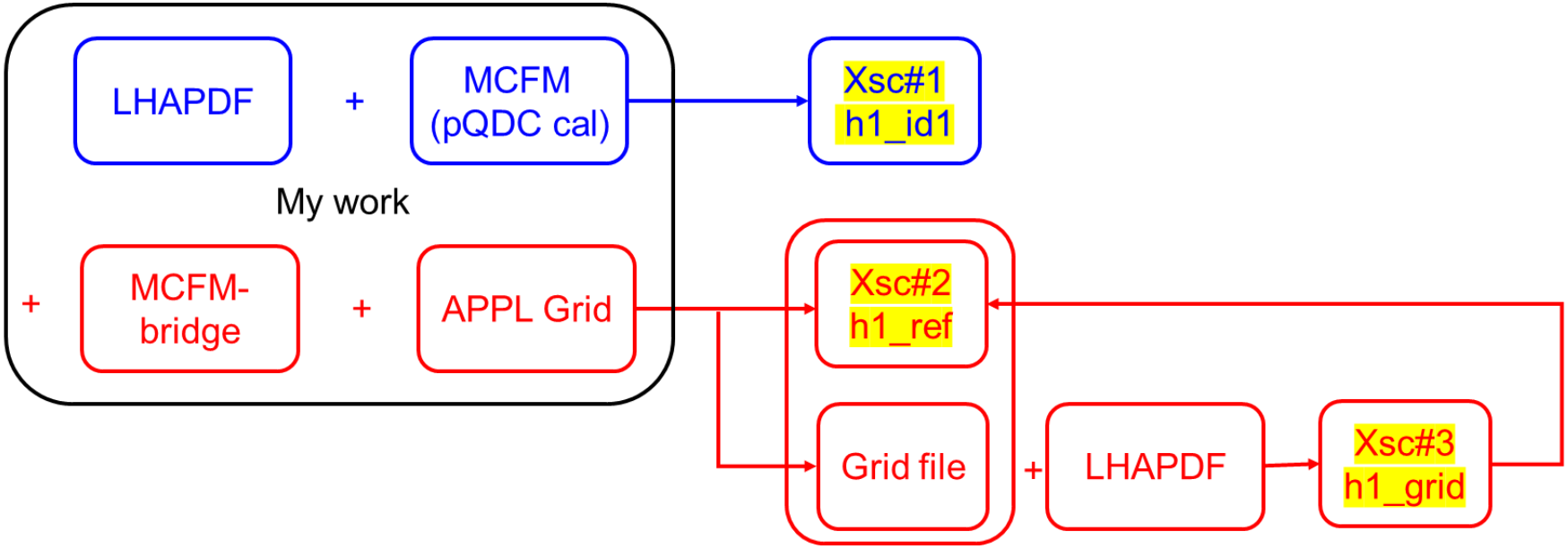


MCFM (mass = [4.3, 4.5], lord)





Work Flow



- MCFM versions : org, pionMod
- Dataset : NA10, pp collision

MCFM_org
Compare w/ NA10 Data

1) MCFM_org can only calculate pp collision, but pion PDF can be apply to grid file as long as the correct kinematic is set.
2) Steps

Calculate pp collision cross section w/ CT14nlo PDF in NA10 kinematics

CT14nlo X CT14nlo : compare h1_ref and h1_mcfm

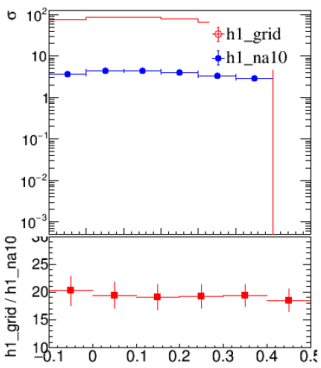
CT14nlo X CT14nlo : compare h1_ref and h1_grid

xFitter X nCTEQ184 : compare h1_grid and h1_na10

My Grid (MCFM set @ LO)

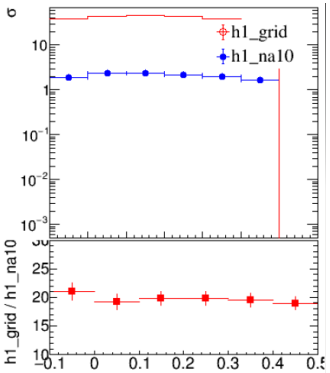
[0, 0.21, 0.24]

[0, 4.011, 4.584]



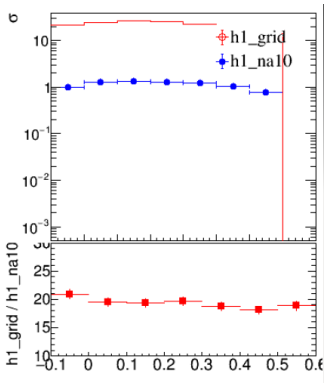
[1, 0.24, 0.27]

[1, 4.584, 5.157]



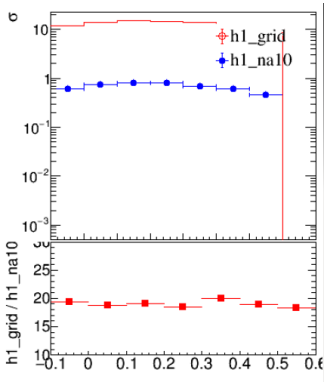
[2, 0.27, 0.30]

[2, 5.157, 5.73]



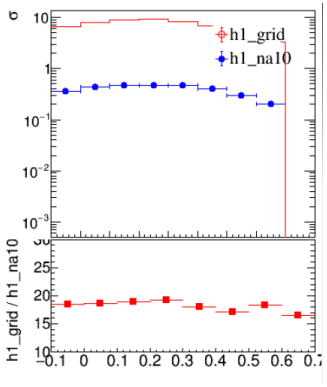
[3, 0.30, 0.33]

[3, 5.73, 6.303]



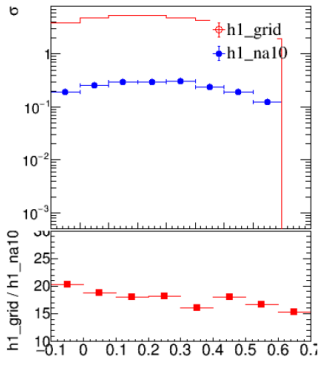
[4, 0.33, 0.36]

[4, 6.303, 6.876]



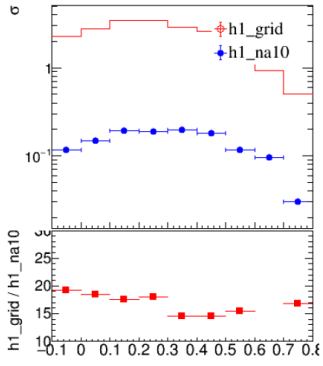
[5, 0.36, 0.39]

[5, 6.876, 7.449]



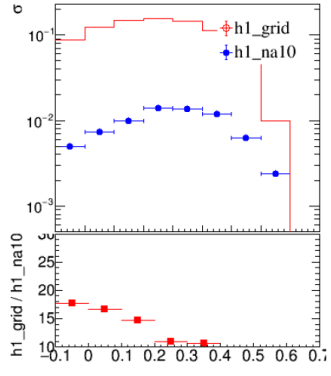
[6, 0.39, 0.42]

[6, 7.449, 8.022]



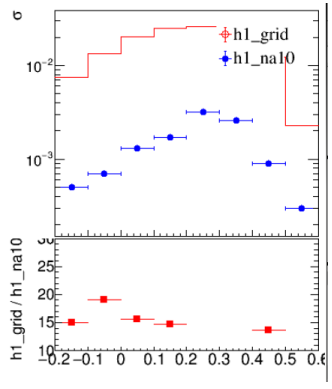
[7, 0.54, 0.63]

[7, 10.314, 12.033]



[8, 0.63, 0.72]

[8, 12.099, 13.752]



- NA10 data
- h1_grid

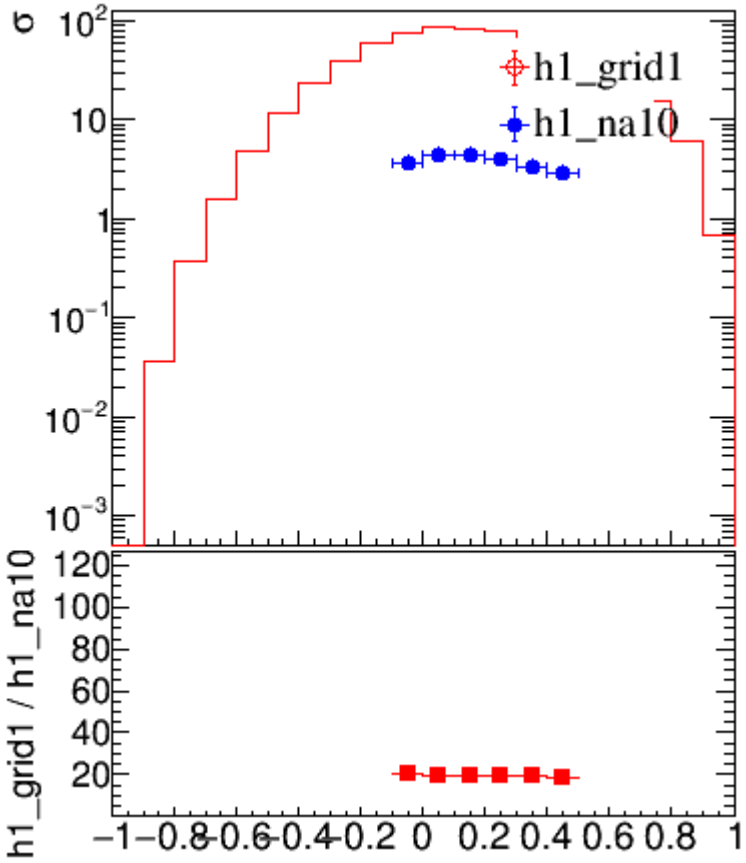
Ratio ~ 20 (LO)

Verify h1_na10 and h1_grid (OK)

[0, 0.21, 0.24]

[0, 4.011, 4.584]

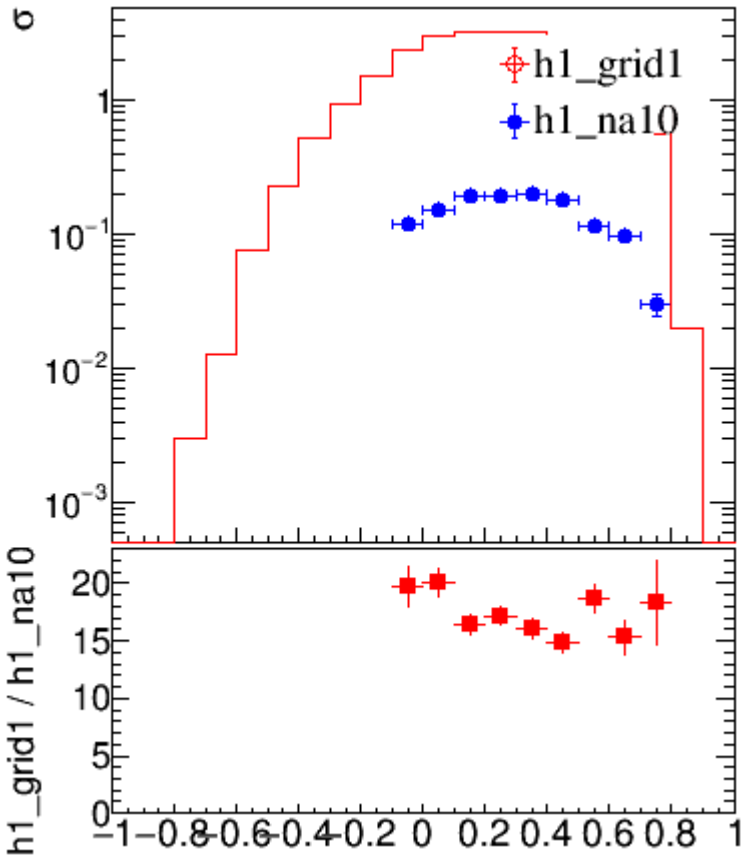
0



[6, 0.39, 0.42]

[6, 7.449, 8.022]

6



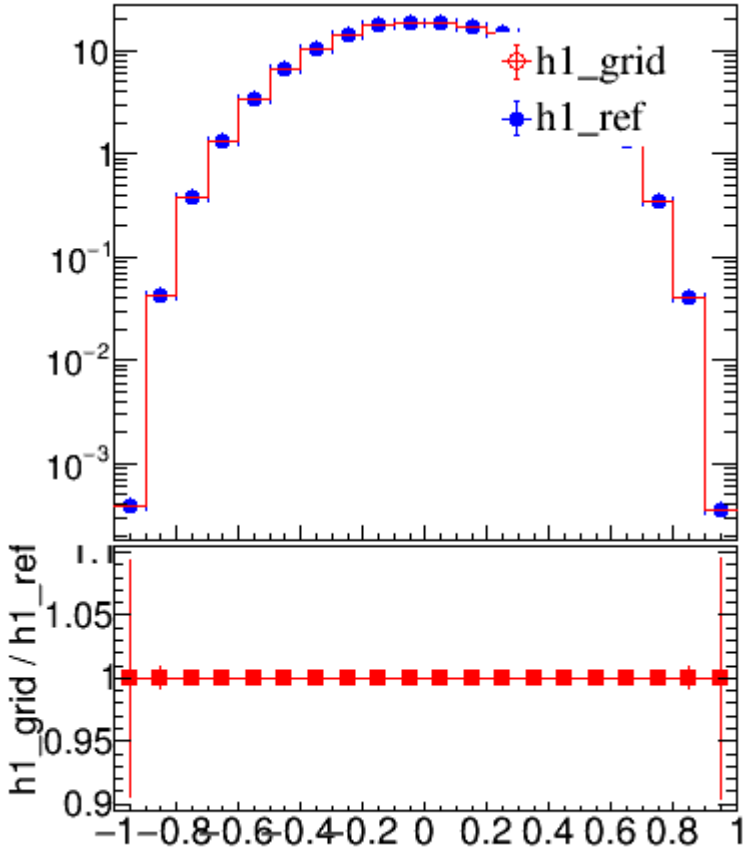
cyTest2_NA10_mcfmOrg_lord_allKin_*_xFitterPI_NLO_EIG_nCTEQ15FullNuc_184_74.root

Variy h1_ref and h1_grid (OK)

[0, 0.21, 0.24]

[0, 4.011, 4.584]

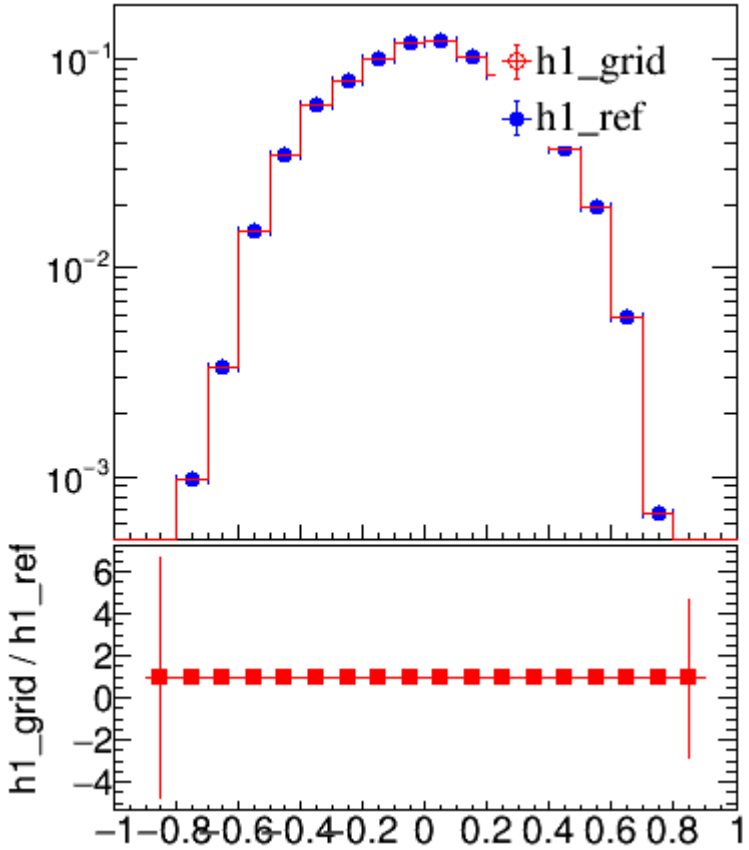
0



[6, 0.39, 0.42]

[6, 7.449, 8.022]

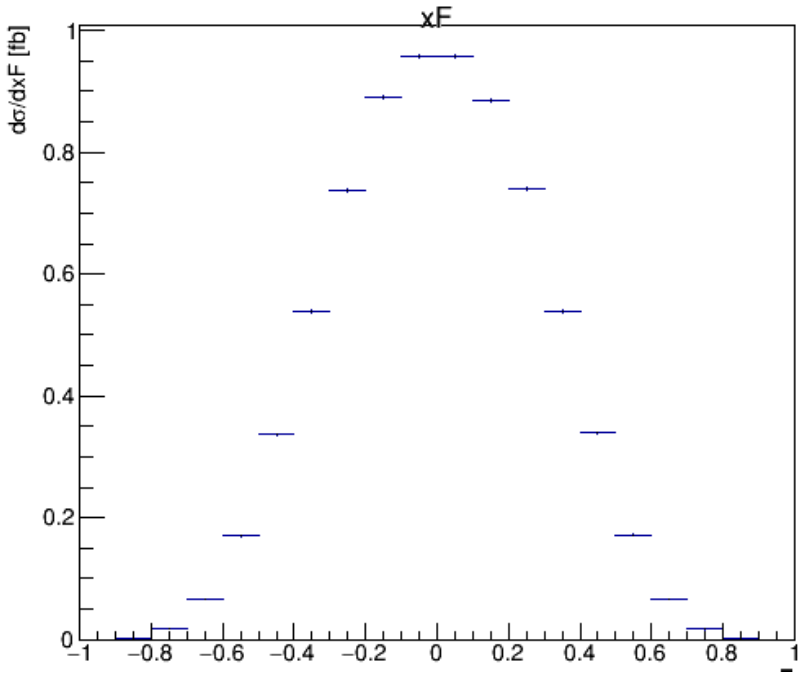
6



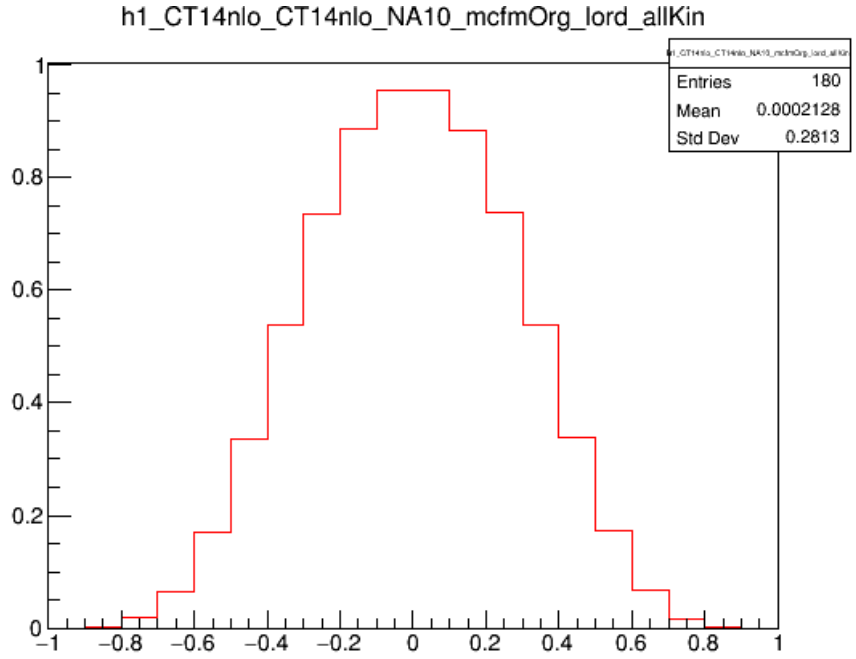
cyTest2_NA10_mcfmOrg_lord_allKin_*_CT14nlo_CT14nlo.root

Varify h1_id1 VS h1_ref/h1_grid (OK)

Mcfm : h1_id1



Sum[h1_ref_{0..8} * sqrtTauBin]



mcfm output “DOES NOT” normalize to sqrt(tau) bin width.

Z_only_lord_CT14nlo_1___1___na10_input_NA10BinAndEnergy_lord_allKin.DAT.C

Grid output has normalize to sqrt(tau) bin width.

cyTest2_NA10_mcfmOrg_lord_allKin_*_CT14nlo_CT14nlo.root

MCFM_pion
Compare w/ NA10 Data

Calculate piW collision cross section in NA10 kinematics

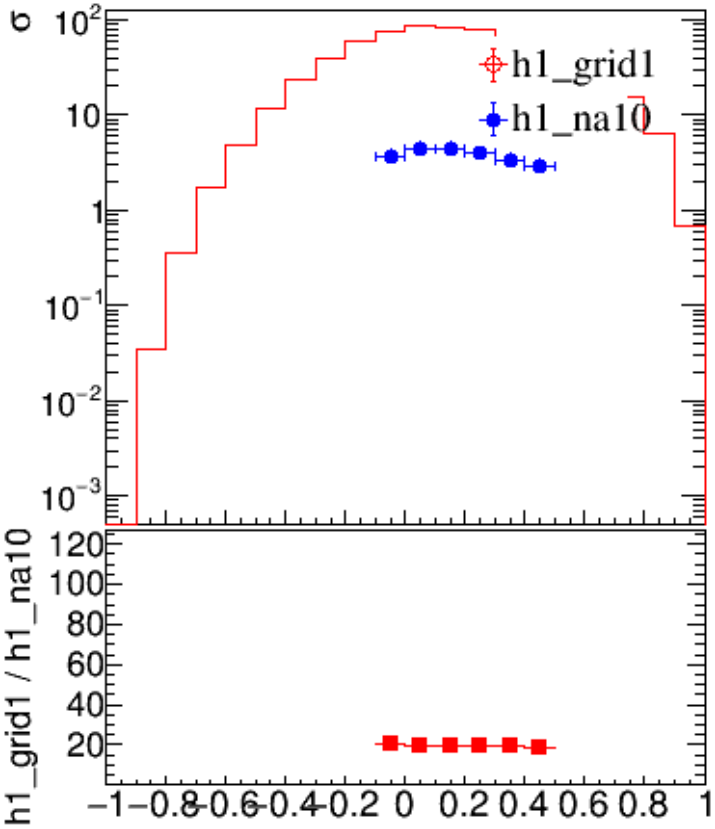
xFitter X nCTEQ184 : compare h1_na10, h1_grid, h1_ref, h1_mcfm(integrated)

Verify h1_na10 and h1_grid (OK)

[0, 0.21, 0.24]

[0, 4.011, 4.584]

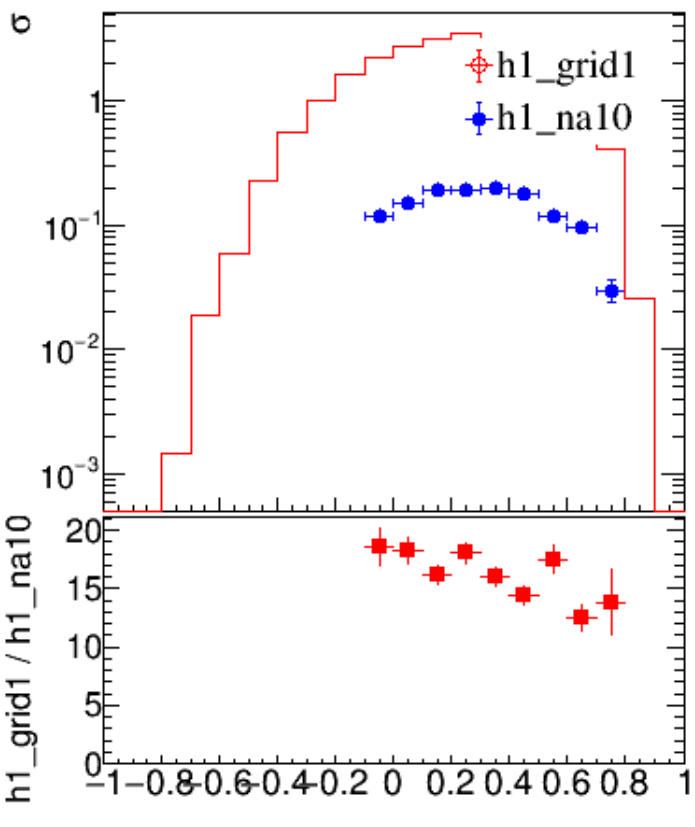
0



[6, 0.39, 0.42]

[6, 7.449, 8.022]

6



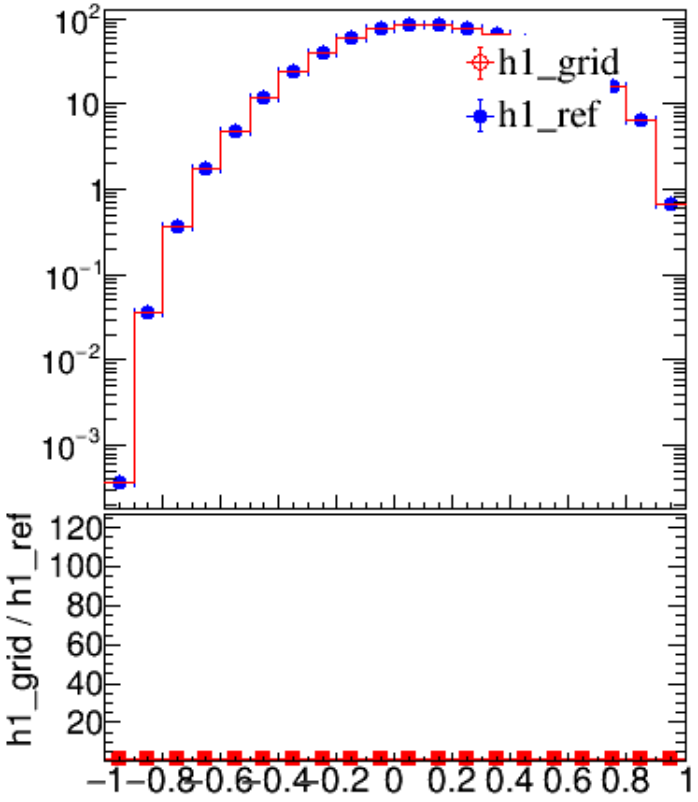
cyTest2_NA10_mcfmPion_lord_allKin_pionPDF_0_xFitterPI_NLO_EIG_nCTEQ15FullNuc_184_74.root

Variy h1_ref and h1_grid (OK)

[0, 0.21, 0.24]

[0, 4.011, 4.584]

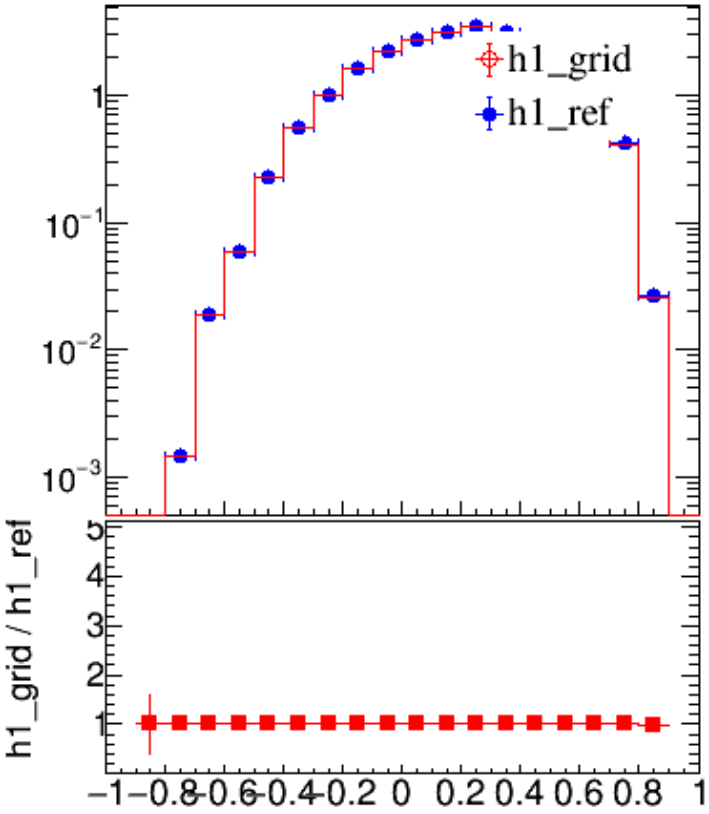
0



[6, 0.39, 0.42]

[6, 7.449, 8.022]

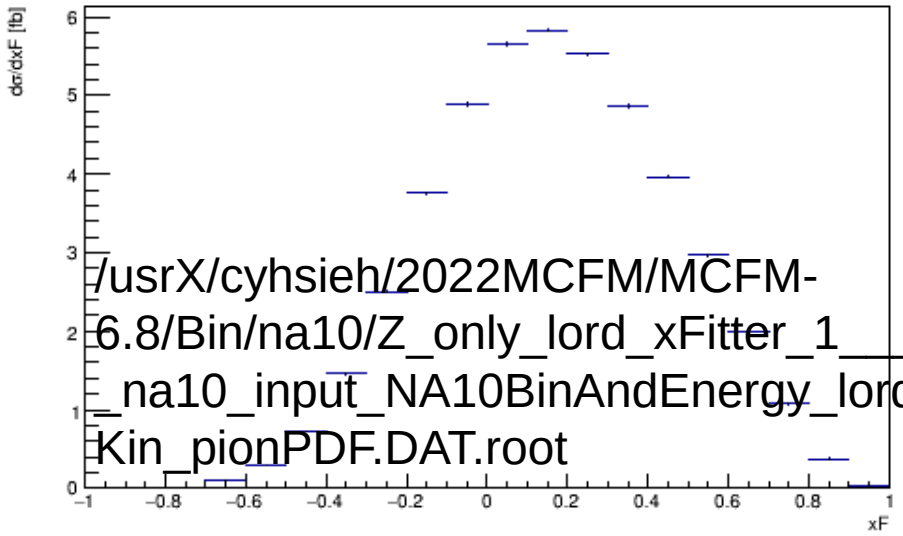
6



cyTest2_NA10_mcfmPion_lord_allKin_pionPDF_0_xFitterPI_NLO_EIG_nCTEQ15FullNuc_184_74.root

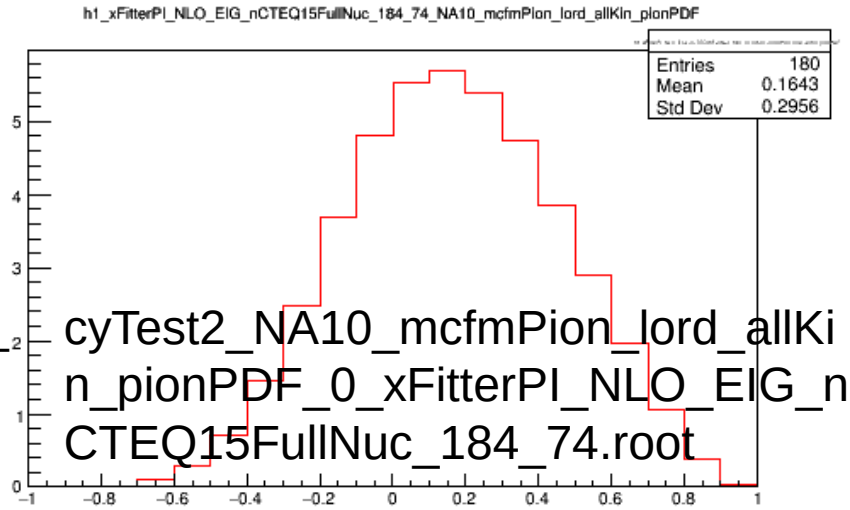
Varify h1_id1 VS h1_ref/h1_grid (OK)

Mcfm : h1_id1

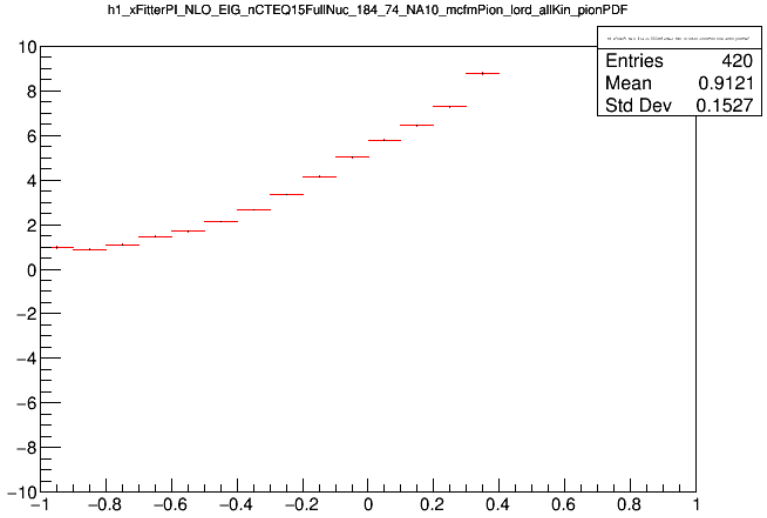


/usrX/cyhsieh/2022MCFM/MCFM-6.8/Bin/na10/Z_only_lord_xFitter_1___1___na10_input_NA10BinAndEnergy_lord_allKin_pionPDF.DAT.root

Sum[h1_ref_{0..8} * sqrtTauBin]



cyTest2_NA10_mcfmPion_lord_allKin_pionPDF_0_xFitterPI_NLO_EIG_nCTEQ15FullNuc_184_74.root



MCFM output is consistent w/ grid calculation!

Summary

- Why MCFM output has a scale 20 difference compare to data?
- Not. NA10_sqrt(s) = 18.8