Open Charm at the EIC

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Bayesian PDF Re-weighting

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48 error sets for EPPS16_Au (20 for nPDF part and 18 for CT14NLO[not used])

k = replica index

$$f_k \equiv f_{S_0} + \sum_i^{N_{\rm eig}} \left(\frac{f_{S_i^+} - f_{S_i^-}}{2} \right) R_{ik}$$

$$\omega_k^{\rm GK} = \frac{\exp\left[-\chi_k^2/2\right]}{(1/N_{\rm rep}) \sum_{k=1}^{N_{\rm rep}} \exp\left[-\chi_k^2/2\right]}$$

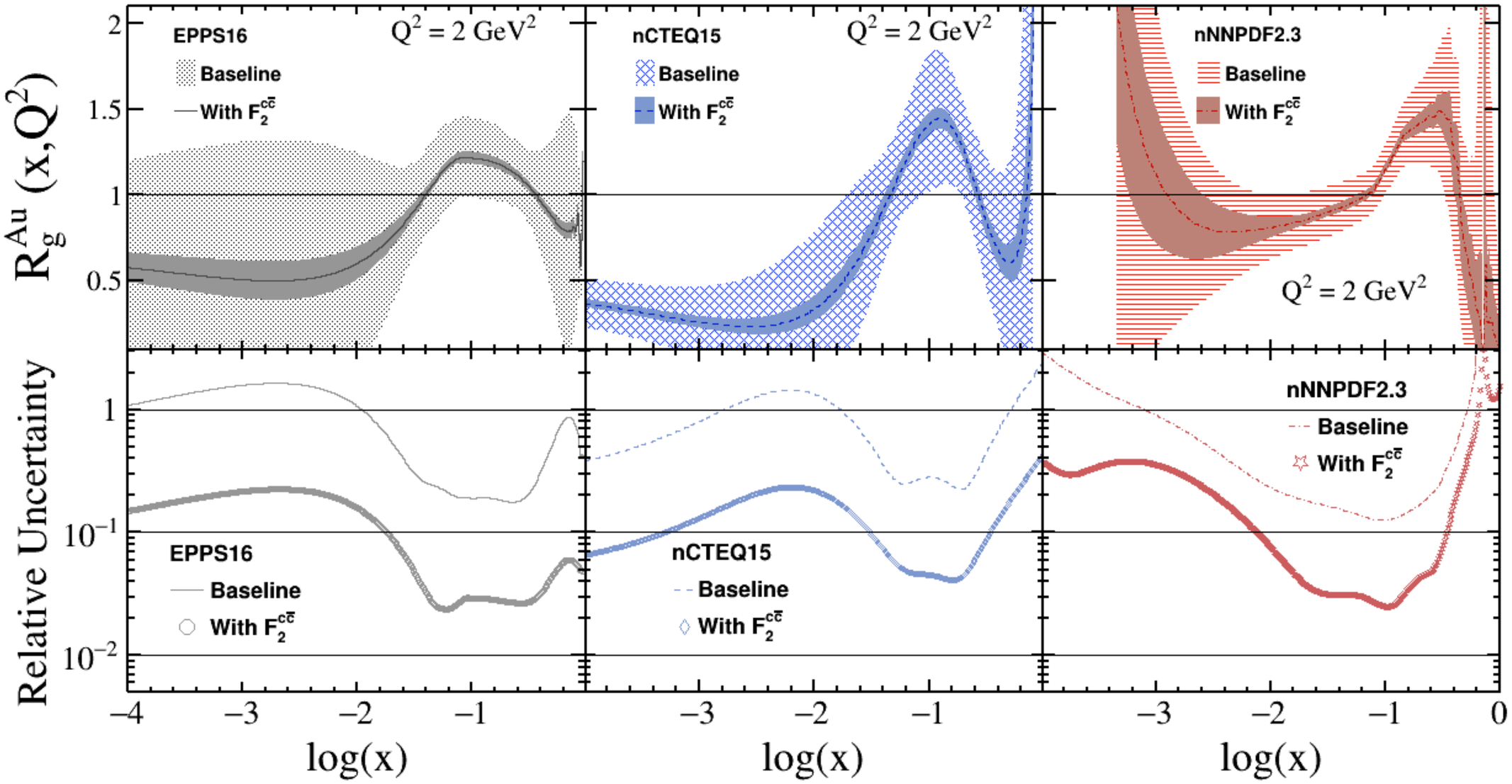
$$f_{\rm new} = f_{S_0} + \sum_i^{N_{\rm eig}} \left(\frac{f_{S_i^+} - f_{S_i^-}}{2} \right) \left(\frac{1}{N_{\rm rep}} \sum_k^{N_{\rm rep}} \omega_k R_{ik} \right)$$

Using photon-gluon fusion events exclusively, re-weighted to conserve estimated cross-section (and errors) in 10x100 and 5x41 collisions

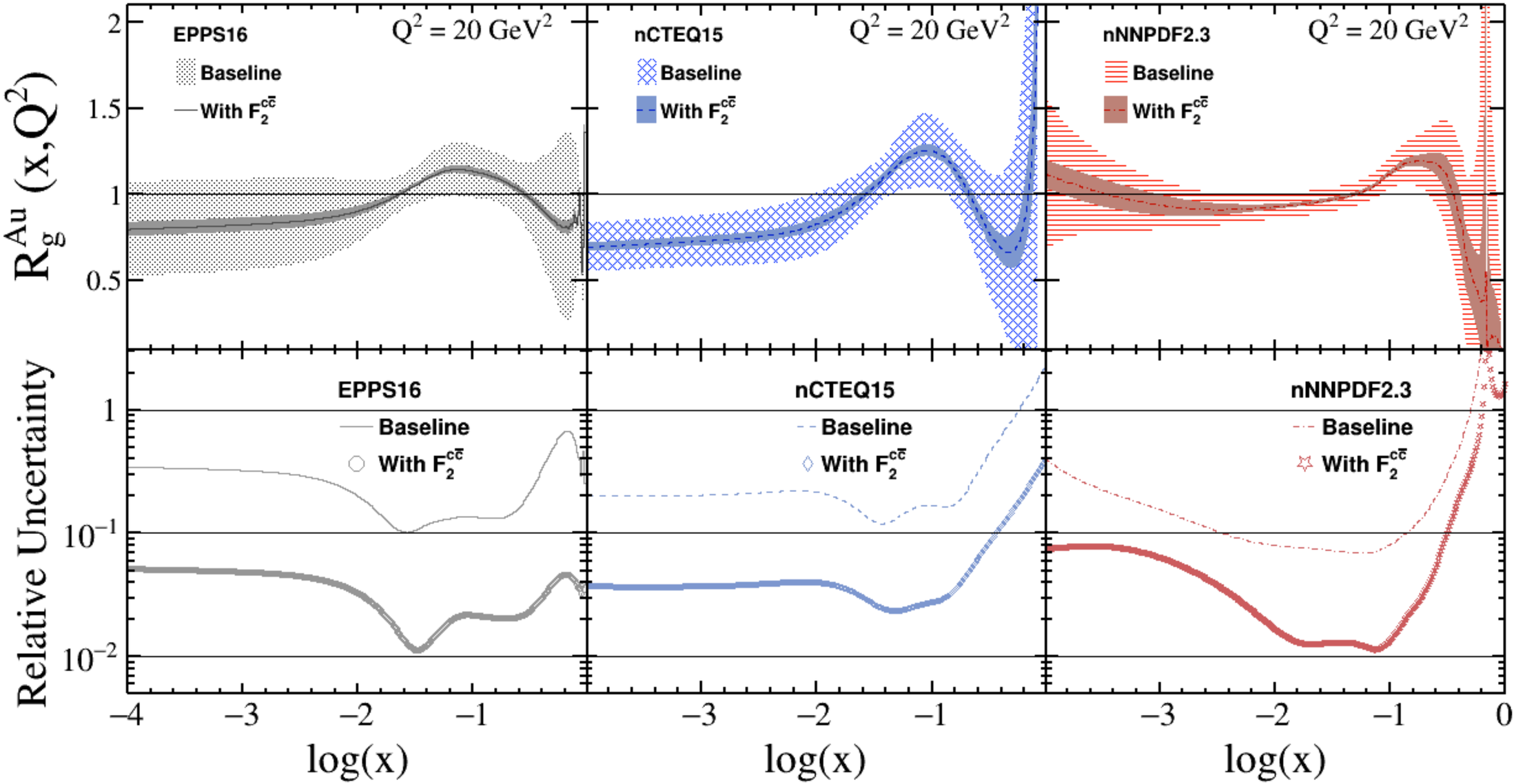
Scaling error bars to 1 fb-1; removed points with rel. error >40%

Randomly displace data points from central value by statistical errors

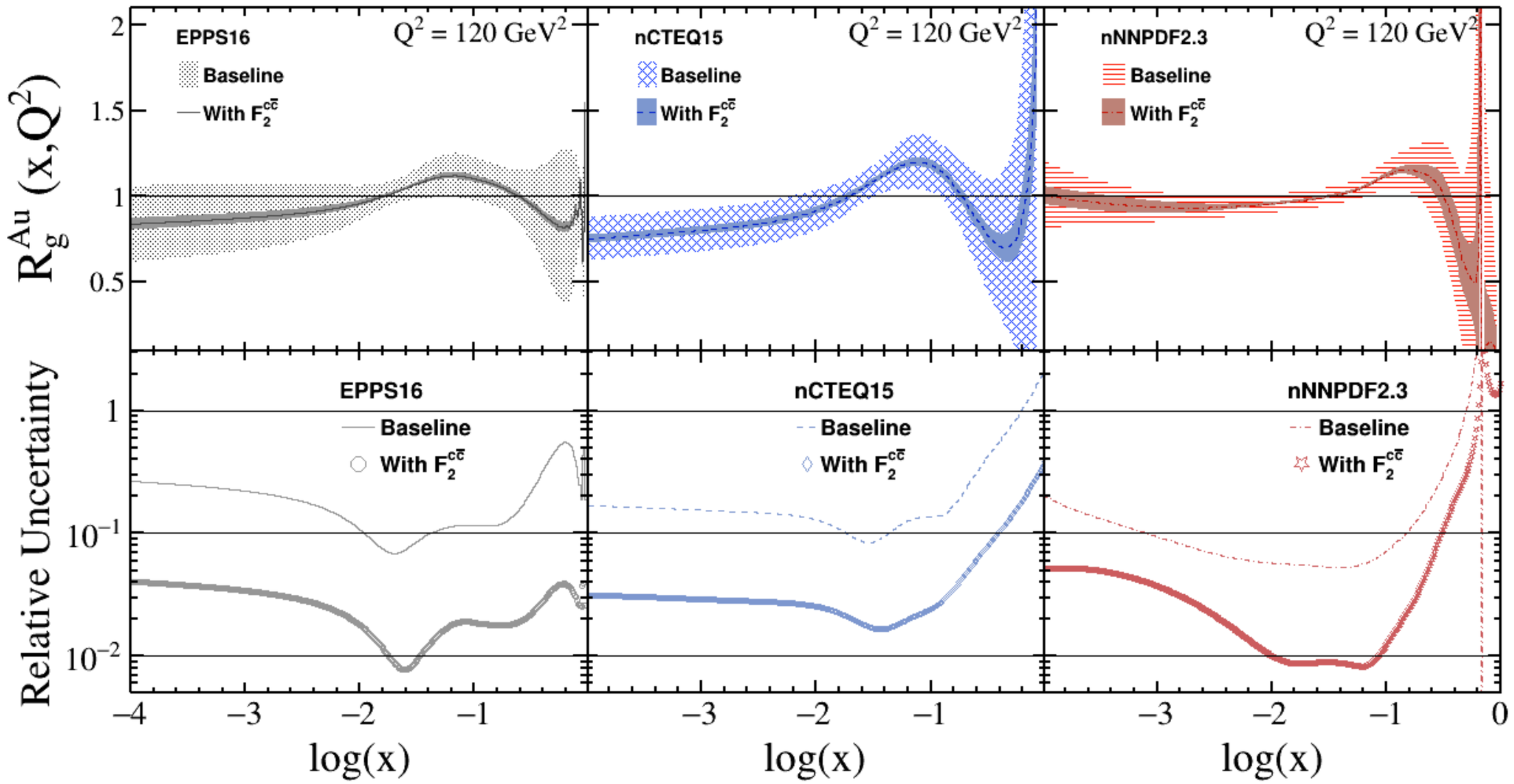
Gluon nPDF


EPPS16
Baseline
With $F_2^{c\bar{c}}$
$Q^2 = 2$ GeV^2
nCTEQ15
Baseline
With $F_2^{c\bar{c}}$
$Q^2 = 2$ GeV^2
nNNPDF2.3
Baseline
With $F_2^{c\bar{c}}$
$Q^2 = 2$ GeV^2
$R_g^{Au}(x,Q^2)$
Relative Uncertainty
nNNPDF2.3
Baseline
With $F_2^{c\bar{c}}$
EPPS16
Baseline
With $F_2^{c\bar{c}}$
nCTEQ15
Baseline
With $F_2^{c\bar{c}}$
log(x)
log(x)
log(x)

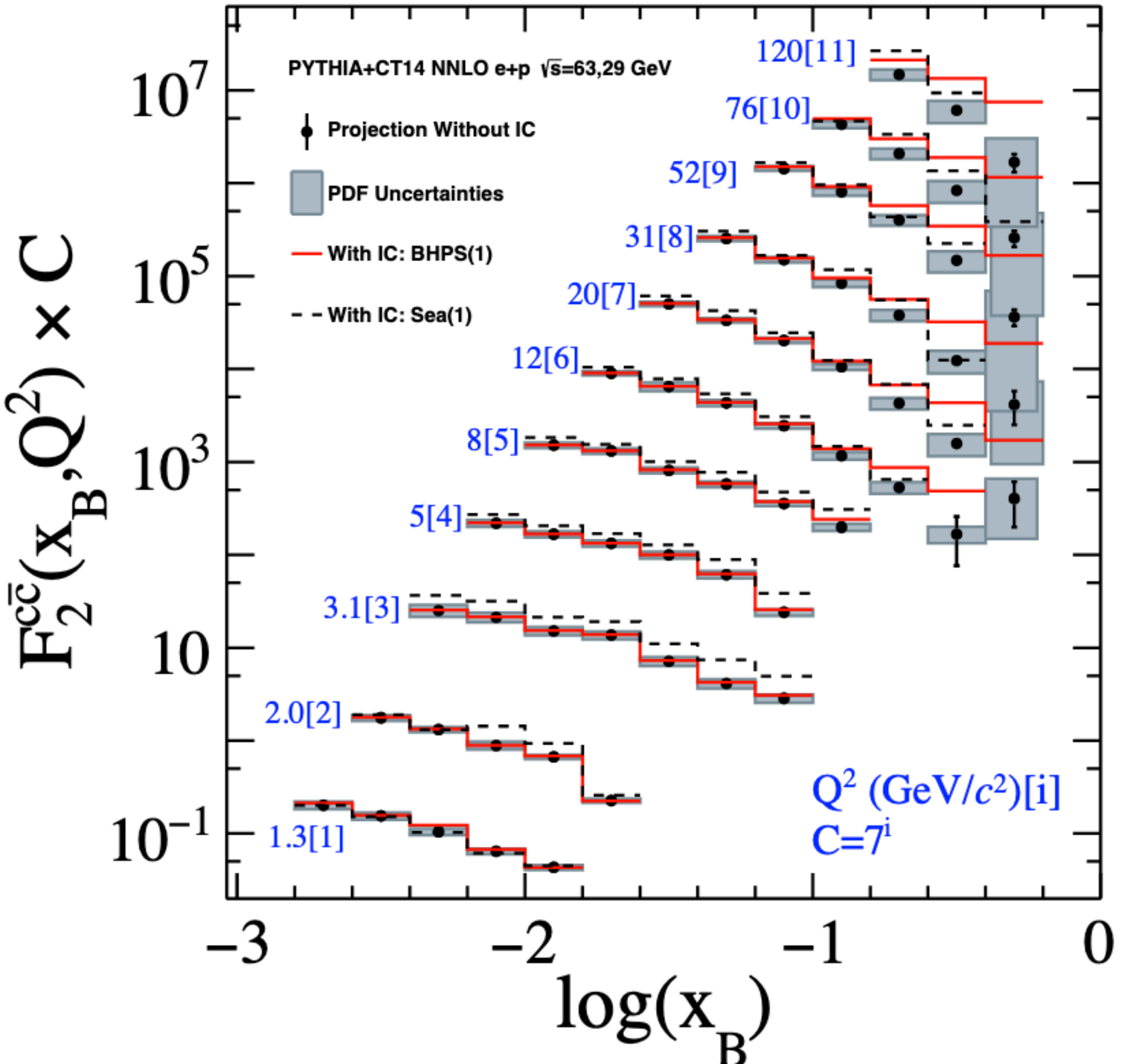
Gluon nPDF


EPPS16
$Q^2 = 20\ GeV^2$
Baseline
With $F_2^{c\bar{c}}$
nCTEQ15
$Q^2 = 20\ GeV^2$
Baseline
With $F_2^{c\bar{c}}$
nNNPDF2.3
$Q^2 = 20\ GeV^2$
Baseline
With $F_2^{c\bar{c}}$
$R_g^{Au}(x,Q^2)$
Relative Uncertainty
log(x)
log(x)
log(x)

Gluon nPDF


EPPS16
Baseline
With $F_2^{c\bar{c}}$
$Q^2 = 120$ GeV^2
nCTEQ15
Baseline
With $F_2^{c\bar{c}}$
$Q^2 = 120$ GeV^2
nNNPDF2.3
Baseline
With $F_2^{c\bar{c}}$
$Q^2 = 120$ GeV^2
$R_g^{Au}(x,Q^2)$
Relative Uncertainty
log(x)
log(x)
log(x)

IC Stu


PYTHIA+CT14 NNLO e+p √s=63,29 GeV
Projection Without IC
PDF Uncertainties
With IC: BHPS(1)
With IC: Sea(1)
120[11]
76[10]
52[9]
31[8]
20[7]
12[6]
8[5]
5[4]
3.1[3]
2.0[2]
1.3[1]
Q² (GeV/c²)[i]
C=7^i
F₂^cc̄(x_B,Q²) × C
log(x_B)
10⁷
10⁵
10³
10
10⁻¹
−3
−2
−1
0

Paper Details

Target: PRC(or D)

Proposed Figures:

1)Feyman diagram for PGF charm production
2)D0 Q2 vs. x coverage
3)D0 kinematic distributions
4)PV resolution
5)Few topological variables from fast simulation
6)Fast and full simulation comparisons of topo. Variables
7)D0 invariant mass w/ and w/o secondary vertex; several regions of phase space
8)Reduced cross sections in e+p @ 10x100 and 5 x41
9)Ex. linear fits for charm F2
10)Structure functions in e+p
11)Impact of intrinsic charm with CT14NNLO PDFs w/ + w/o IC
12)F2 ratios in e+Au / e+p w/ nPDF uncertainty bands before and after Bayesian re-weighting
13)Impact on Gluon nPDFs for few representative Q2 bins+ratio of uncertainty improvement

BACKUP