

Updates from PACs

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Physics Analysis Coordination Meeting – Sep 15th, 2026

○ Early Science Report

- Need for the analyses on already available July campaign simulations to roll out soon
 - pseudo-data need to be handed over to the fitters
- NIM-A submission target for ESR and 4 accompanying PWG papers: end of October

○ July Campaign Status Page (“user view”): https://epic-devcloud.org/prod/?user_view=1

○ Next PAC meeting: September 29

- At that venue: PWG conveners reports on ECR pseudo-data

○ Next Physics Forum: tentatively October 6

○ NIM-A plans (a reminder):

- **Phase 1 (by end of October 2026):** early running related papers
- **Phase 2 (Nov. 2026 - Feb. 2027):** performance paper (TDR Ch.4 spin off, BSM+EW paper)

DISCUSSION: ESR plots status

Parton Distributions in the Proton

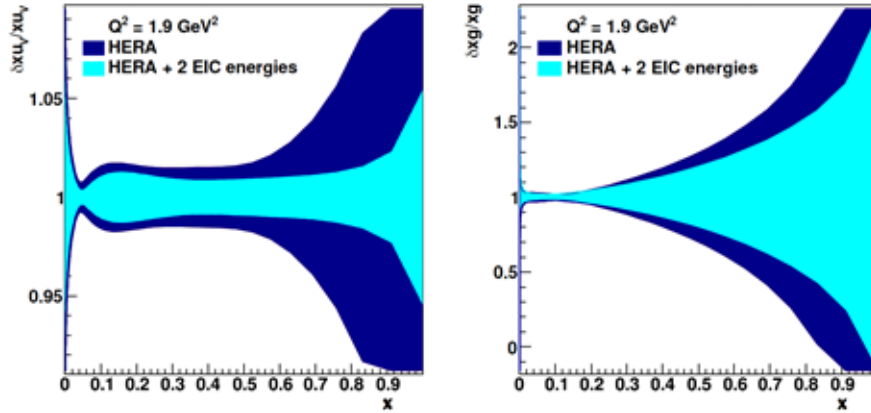


Figure 3: Impact of early science data on the NNLO collinear parton distributions of the proton, shown on a linear x scale and performed using the HERAPDF2.0 NNLO fitting framework [106] and xFitter fitting platform [107]. The bands show relative experimental uncertainties for the up-valence (left) and gluon (right) distributions.

NOTES

- pseudodata running right now for the pseudo-data couple of data
- fits and codes being reproduced.

NOTES

- same pseudo-data
- requires Katarzyna, next week she's around
- include Bj some rule: possibly... discussion at the next Inclusive meeting

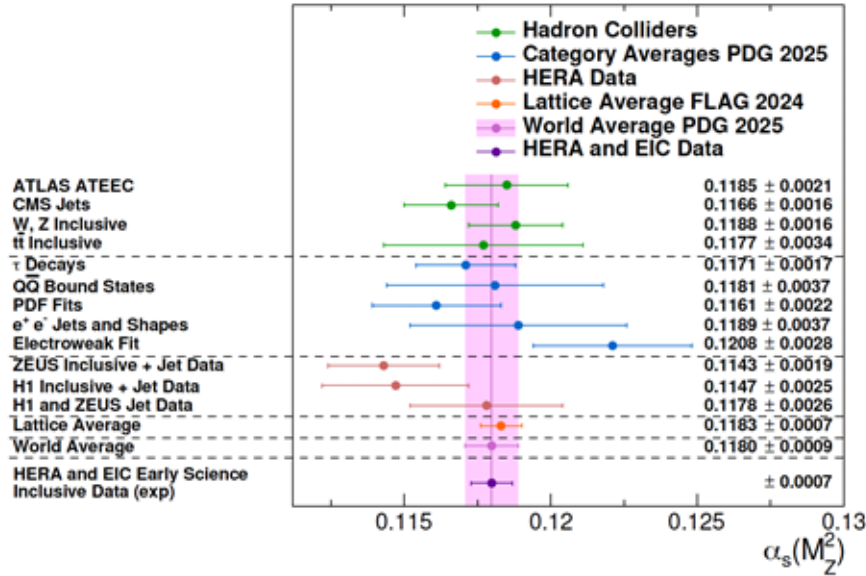


Figure 4: Comparison of the early science projected α_s accuracy with existing measurements and the world average from the data linked in the 2026 PDG review on QCD [109].

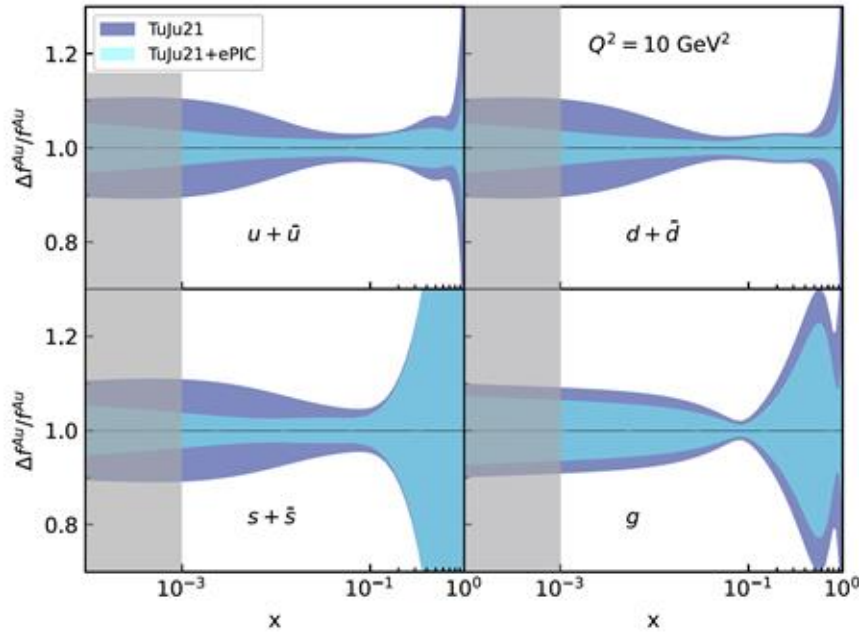
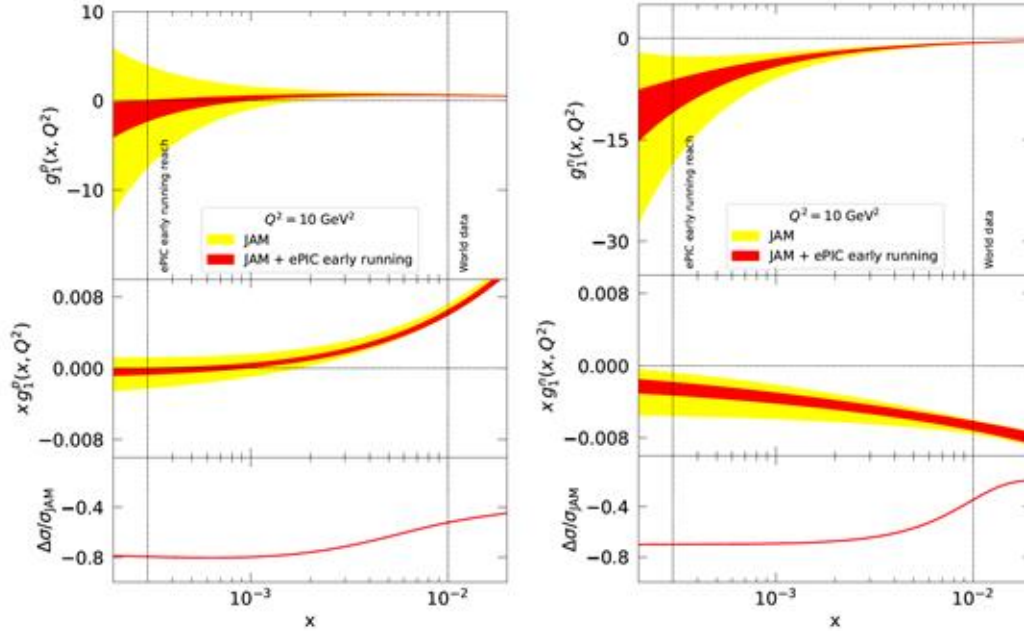


Figure 5: Impact of early science inclusive data on nPDFs for a gold nucleus. The relative uncertainties of the nPDFs before and after reweighting of a global nPDF set (TUJU21 [25]) with EIC e+Au pseudo-data are shown as a function of x at $Q^2 = 10 \text{ GeV}^2$. The region of x extending below 10^{-3} is shaded, since it will not be directly constrained by experimental data.

NOTES

- Issue in the simulation sample -> samples only have neutron events. being discussed on github
- Eventually only the proton sample can be used to generate the plots
- Working (S. Maple) on global fit better showing of performance vs reweighting

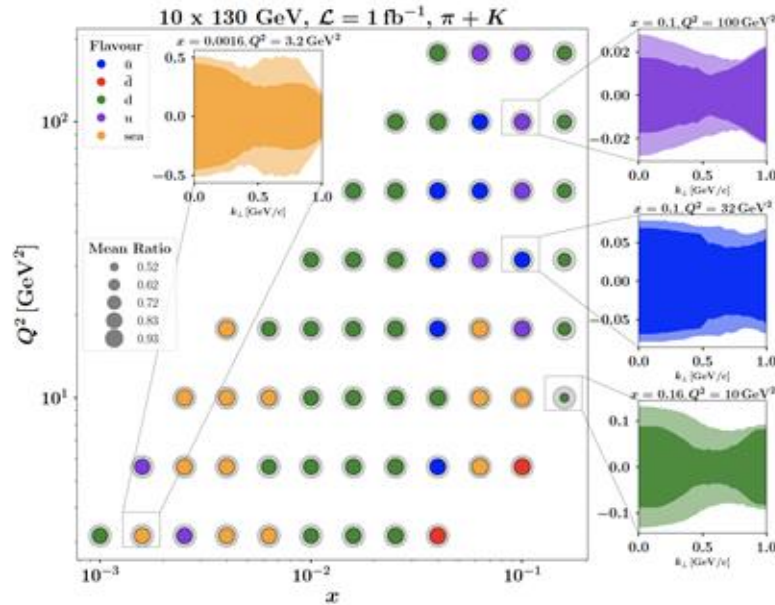


NOTES

- Newest plots available already.

Figure 6: Left: impact of projected A_1 data on g_1^p . Right: impact of projected A_1 data on g_1^n . The top and middle panels show uncertainties from JAM global fits [111] for g_1 and xg_1 , respectively, at $Q^2 = 10 \text{ GeV}^2$ with (red bands) and without (yellow bands) projected early science ePIC data. The bottom panels show the corresponding fractional uncertainty reductions relative to current JAM results. The vertical dashed lines indicate the regions directly constrained by data.

Unpolarized TMDs



NOTES

- Salvatore on track of it, working on binning.
- Almost ready to be handed over to the fitters (Marco et al.)
- respond and addresss over emails then move on.

Figure 8: Impact of early SIDIS data on TMD PDFs by MAPTMD24 [119] from 10 GeV $\times$ 130 GeV collisions and a collected luminosity of 1 fb^{-1} . Inner (outer) circles represent the maximum uncertainty averaged over all k_T with (without) ePIC data, whereas colors indicate the most impacted quark flavors. Current uncertainties (lighter/gray shades) are compared to the expected improvements (darker shades) after incorporating ePIC pseudo-data.

Sievers TMD – Quark Tensor

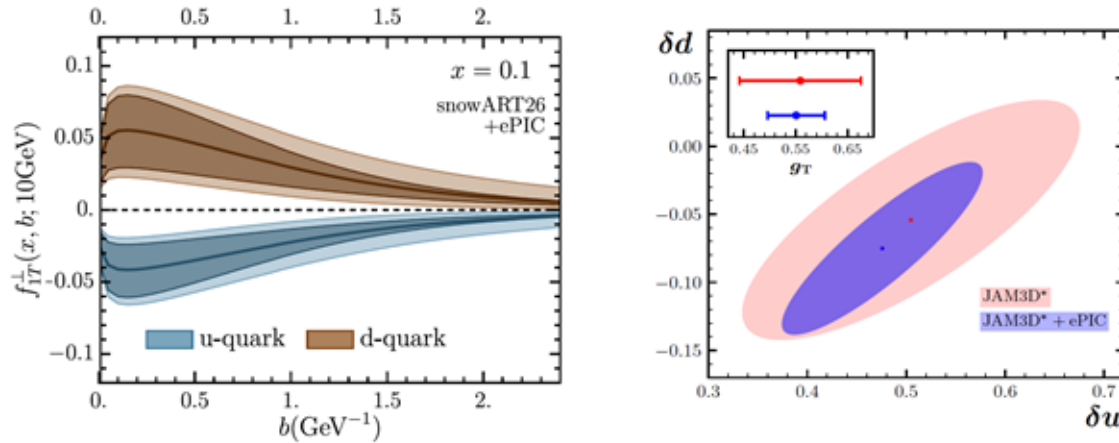


Figure 9: Left: Expected uncertainties of the u - and d -quark Sievers function as a function of the b parameter conjugated to the quark momentum k_T for $x = 0.1$, based on [124]. The light shaded uncertainties represent the current uncertainties while the dark shaded uncertainties represent the impact including the early EIC data. Right: Expected uncertainties on the up and down quark tensor charges when including the early EIC data based on [129, 130]. The pink shaded area represents the current uncertainties while the purple region represents the uncertainty when including the early EIC data from $e+p$ and $e+^3\text{He}$ collisions.

NOTES

- Ralf showed last week that data is ready.
- Can me handed over to Daniel and Alexei

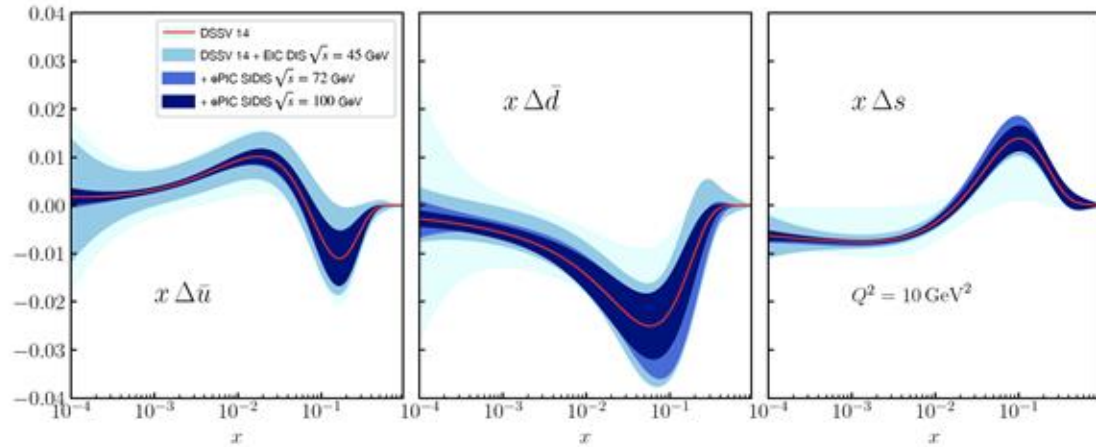


Figure 10: Expected impact of the semi-inclusive double-spin asymmetry measurements on the sea-quark helicities as a function of x . The light blue shaded regions represent the current knowledge, based on [140], and the slightly darker shaded area (DSSV 14 + EIC DIS $\sqrt{s} = 45$ GeV) includes a set of 10 fb^{-1} of pseudo-EIC inclusive DIS data at a center-of-mass energy of $\sqrt{s} = 45$ GeV, added in order to perform the reweighting with the SIDIS data. The darker shaded regions represent the uncertainties when including in addition separately early ePIC data at the two different collision energies of $10 \text{ GeV} \times 130 \text{ GeV}$ and $10 \text{ GeV} \times 250 \text{ GeV}$.

NOTES

- Identify the scattered electron through true PI. update to electron method.
- Ignacio on paternity leave? Charlotte on it with fitters. A bitt worrying on the time

NOTES

- Main point is on full refit. Pia handed code to Xavier (Charlotte's student) who is on top of it. Still unable to run it.
- *deadline given to Xavier...

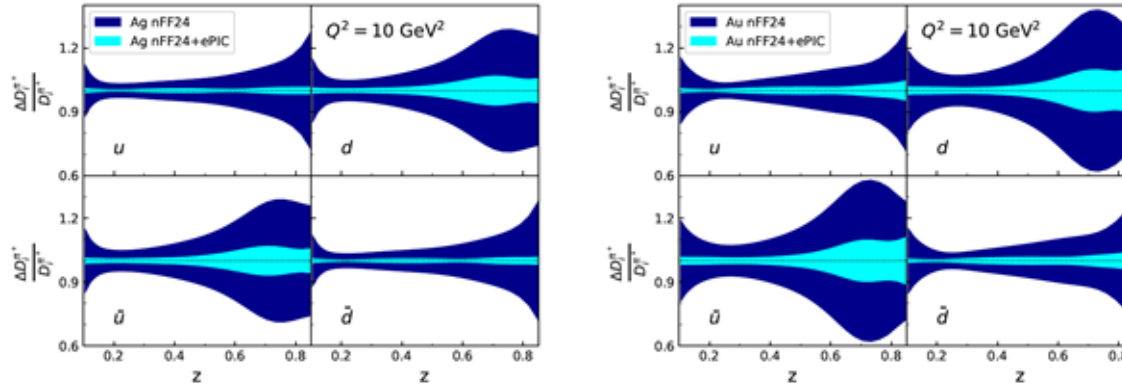


Figure 11: Current relative uncertainties on nFFs [152] (dark-blue) and relative nFF uncertainties from the reweighting study performed here, as described in the text (cyan). Left: for Ag. Right: for Au.

Di-hadron Correlations

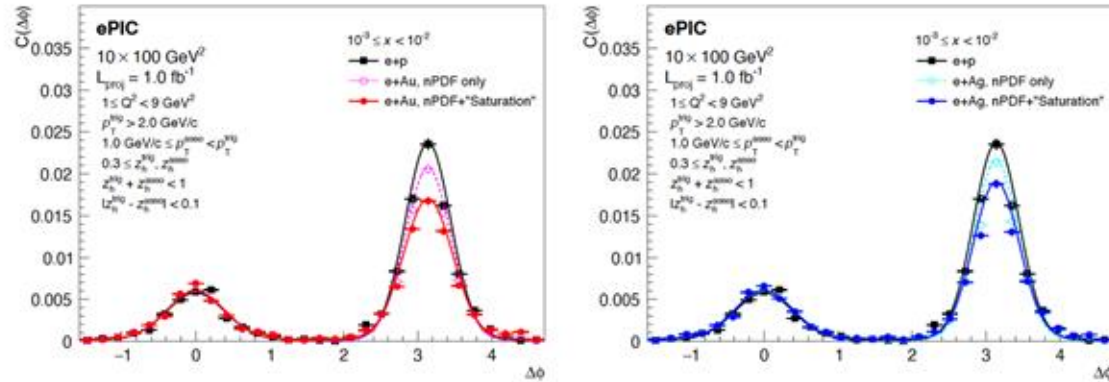


Figure 12: Correlation functions of $e + p$ (black) and $e + A$ without “saturation weight” (light color) and with “saturation weight” (dark color) in the range $10^{-3} \leq x < 10^{-2}$. Left: $e + Au$. Right: $e + Ag$. While this figure is not based on full simulations, no significant changes are expected due to the high efficiency and resolution of the ePIC tracking system.

NOTES

- Gabriel back to Brazil, needs his BNL account approved. Probably not taking very long
- Maybe Rosi can expedite it.

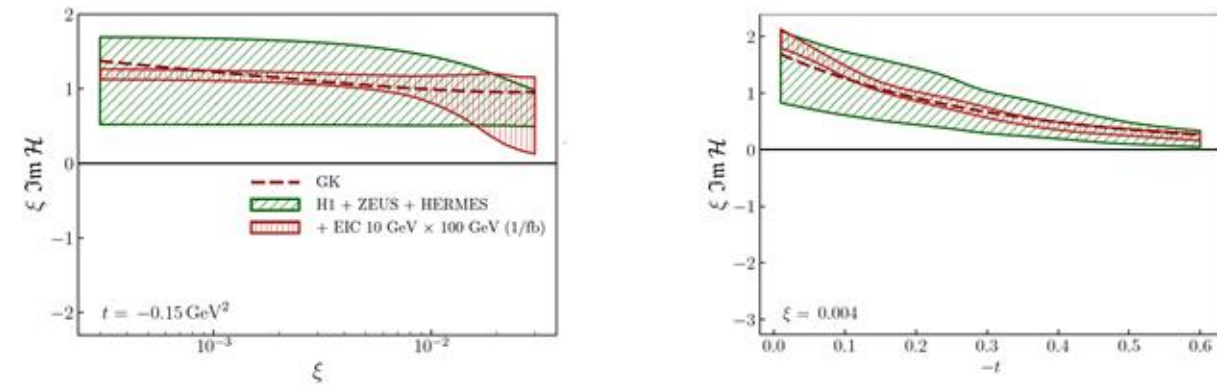


Figure 14: Left: $\text{Im } \mathcal{H}$ as a function of ξ . Right: $\text{Im } \mathcal{H}$ as a function of $-t$. Both are extracted by training an ensemble of neural nets on HERA data only (green slanted dashes) and additionally on simulated EIC data (red vertical dashes) at $Q^2 = 4 \text{ GeV}^2$. Goloskokov-Kroll (GK) model values [188, 189] are plotted for comparison (red dashed line).

NOTES

- We have the pseudo-data.
- Waiting for the fitters. Pawel+Kreso

Exclusive phi in e+Au

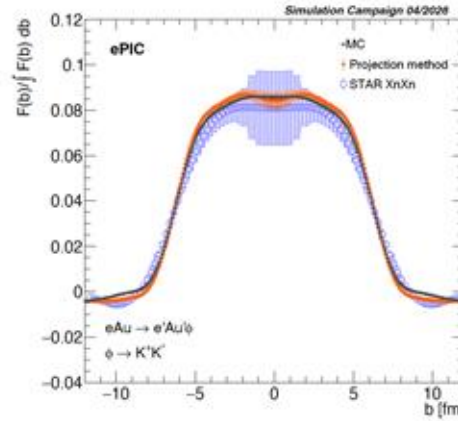
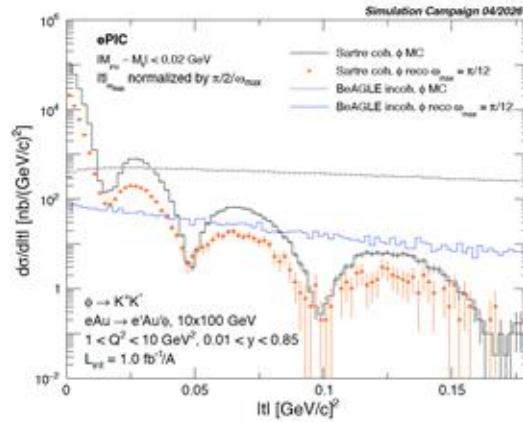


Figure 15: Left: Generated (continuous, black line) and reconstructed (orange points) $|t|$ distribution for the selection of exclusive ϕ production, with $\phi \rightarrow K^+K^-$, in $e + \text{Au}$ collisions. The suppression (blue line) of the generated (gray line) incoherent contribution is also shown. The reconstructed result uses the projected- $|t|$ method with a wedge selection $\omega < \omega_{\max} = \pi/12$ around the direction $\hat{n}$ normal to the electron scattering plane; the distribution is normalized by the accepted angular phase-space fraction. Right: Fourier-Bessel transform of the reconstructed $|t|$ distribution, illustrating the resulting transverse spatial gluon profile in the nucleus. The ePIC projection result is compared with the MC truth and with the STAR Xn + Xn result from coherent ρ^0 photoproduction in ultra-peripheral Au + Au collisions [I9I].

NOTES

- Production probably ready
- No news from Maci yet.
- Next week on Monday EDT conveners will find out

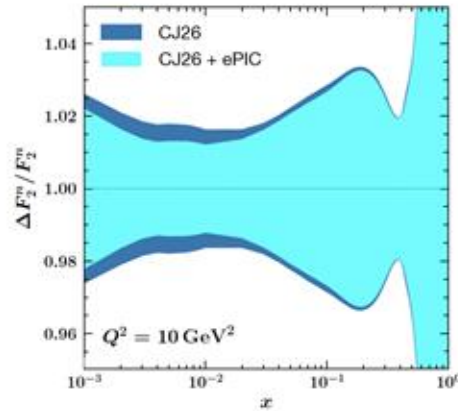


Figure 16: Projected impact of early ePIC spectator-tagged deuteron data on the neutron structure function F_2^n in the CJ26 framework [13]. The upper panel shows the relative uncertainty band for F_2^n at $Q^2 = 10 \text{ GeV}^2$ before and after including ePIC pseudo-data sample corresponding to 1 fb^{-1} .

NOTES

- Pseudodata ready
- Jan on it. He is hearing from Alberto. 2 weeks time

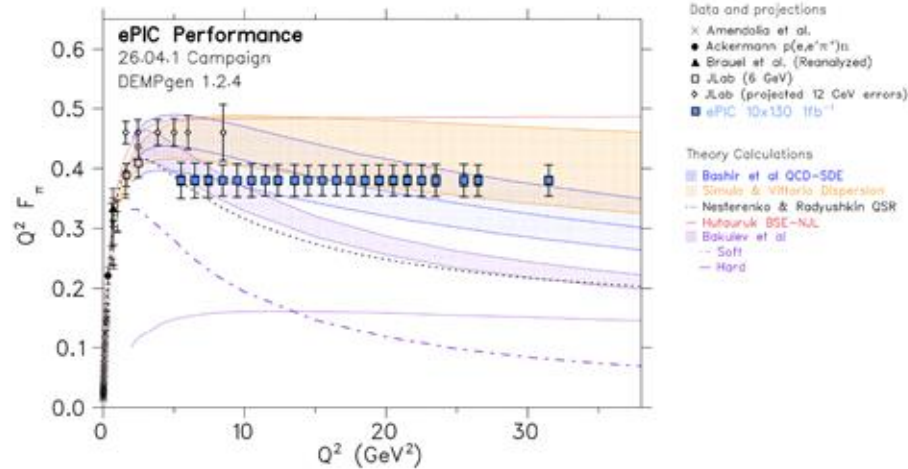


Figure 17: Existing data and projected uncertainties for future data on the pion form factor from JLab and ePIC (blue), in comparison to a variety of hadronic structure models. The projected ePIC data have double error bars, where the inner error bar includes only statistical and assumed point-to-point systematic errors, and the outer error bar includes also the correlated systematic errors. For most of the ePIC data points, the statistical errors are smaller than the marker and only the total uncertainty is visible.

NOTES

- We got a new version of the plot. Stephen K. can upload it soon after checking a few things in the reco

NOTES

- An issue with eAu, the inclusive kinematics missing, working on it.
- S. Maple can pass a snippet to calculate manually

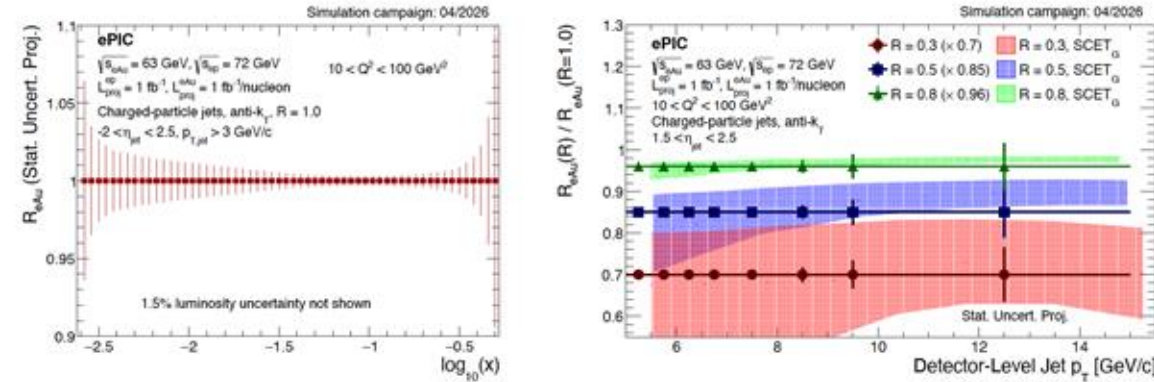


Figure 19: Left: projected statistical precision for inclusive charged jet R_{eA} for $R = 1.0$ as a function of $\log(x)$. Right: projected statistical precision for inclusive charged jet R_{eA} for $R = 0.3, 0.5$, and 0.8 as a function of jet transverse momentum. The beam energies are $10 \text{ GeV} \times 100 \text{ GeV}$ for $e + \text{Au}$ collisions and $10 \text{ GeV} \times 130 \text{ GeV}$ for $e + p$ collisions. In the right panel, the data points are vertically shifted for clarity. The theoretical calculations [217] are shown as shaded bands. SCET denotes soft-collinear effective theory.

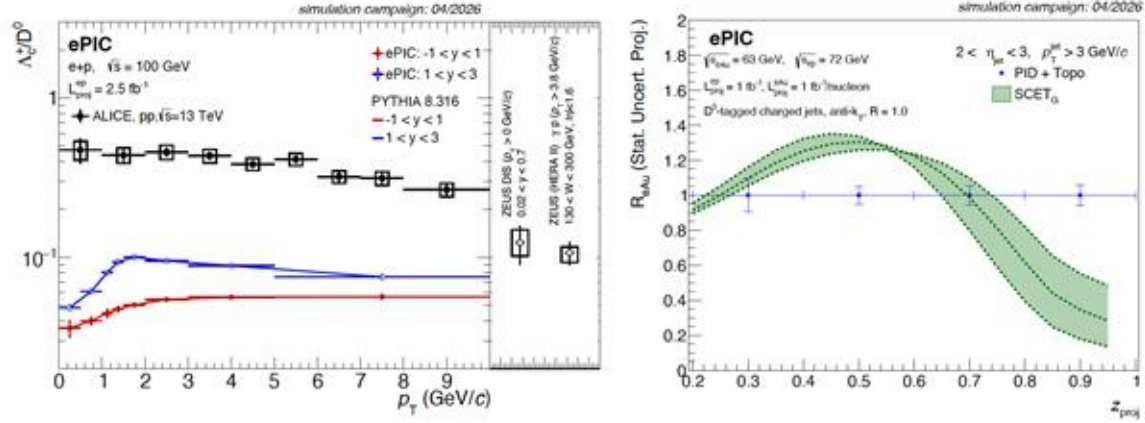


Figure 20: Left: projected inclusive Λ_c^+/D^0 ratio as a function of p_T at mid ($-1 < y < 1$) and forward ($1 < y < 3$) rapidities in 10 GeV $\times$ 250 GeV $e + p$ collisions. The error bars correspond to the statistical precision for an integrated luminosity of 2.5 fb^{-1} , while the curves represent PYTHIA 8.316 predictions. The projected ePIC measurements are shown together with existing ALICE [218] and ZEUS measurements [221, 222] for comparison. Right: statistical projection (blue solid markers) for the measurements of modifications to the D^0 fragmentation function within charged jets in $e + Au$ collisions relative to $e + p$ collisions, in the forward region ($2 < \eta_{jet} < 3$), assuming an integrated luminosity of 1 fb^{-1} . The projection is compared with the theoretical predictions (dotted filled bands) based on soft-collinear effective theory with Glauber gluons (SCET_G) [225, 226].

NOTES

- Shyam already produced the plot
- He sees issues with the branching ratios in different campaigns $\rightarrow$ investigating