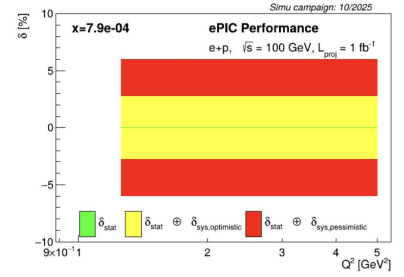
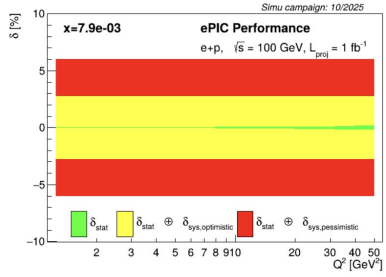
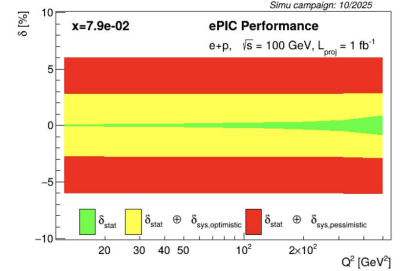
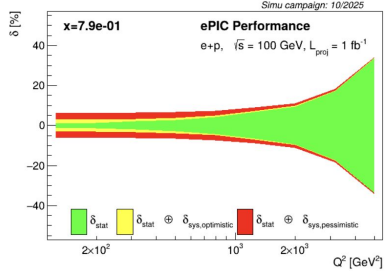
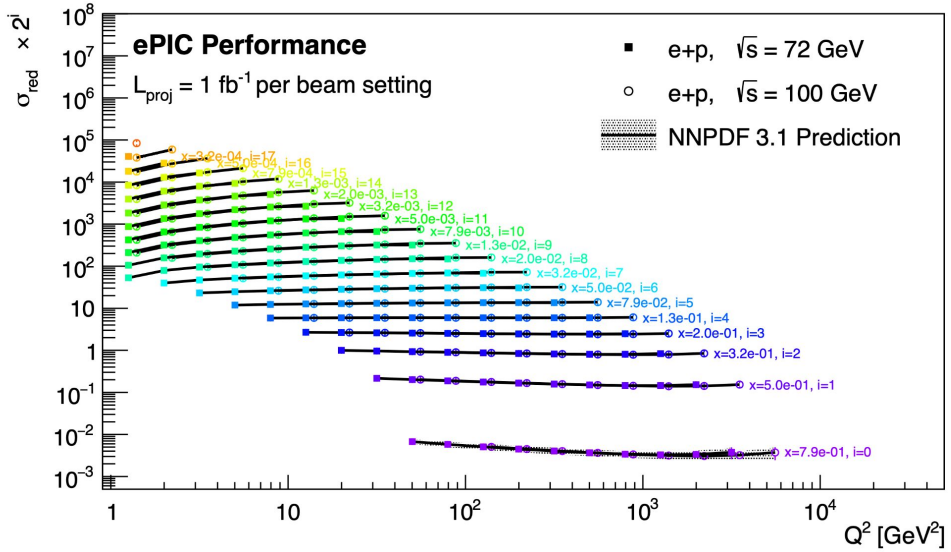


Early Science Milestone & Recent Highlights

Inclusive Physics Working Group
ePIC General Meeting, 06/17/2026

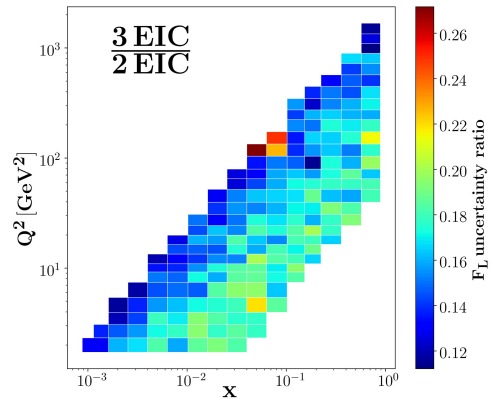
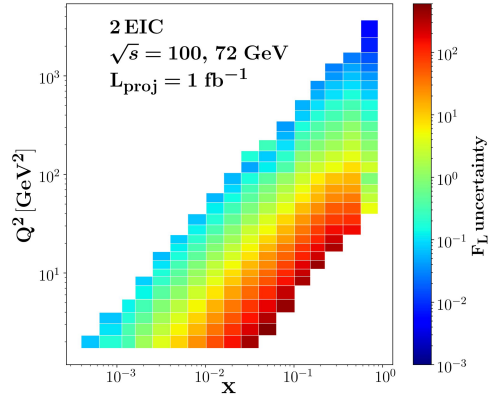
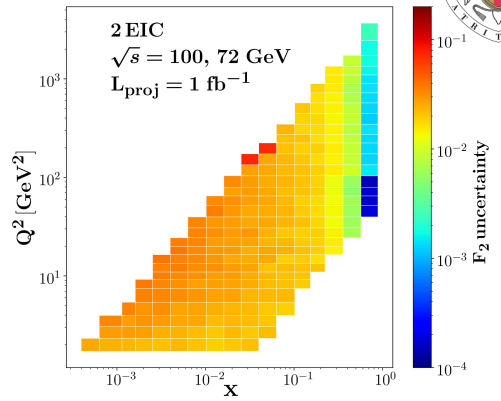
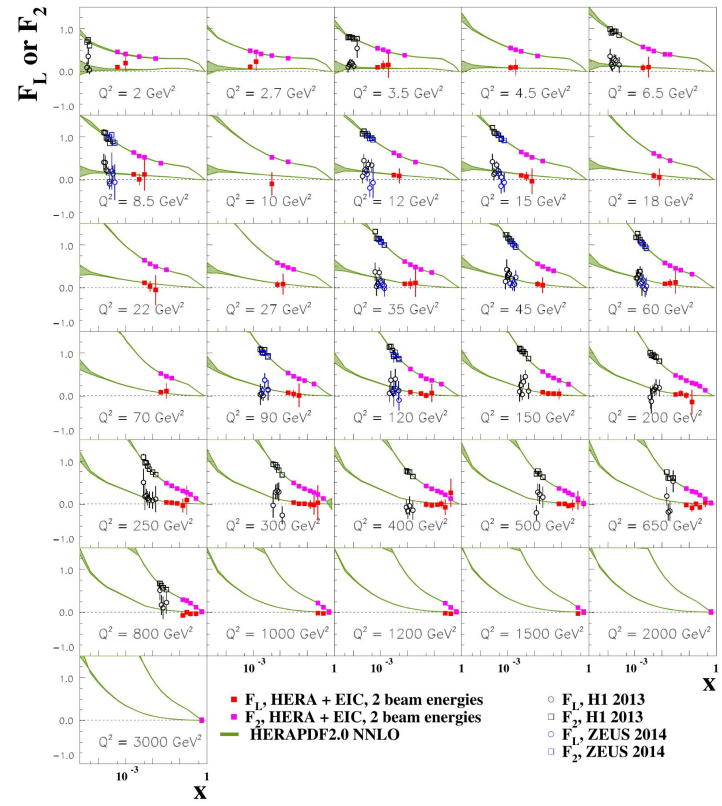




- Studies used to estimate precision and x - Q^2 phase-space of NC inclusive cross section measurements
 - Statistical uncertainties and binning from full simulation
 - Systematics derived from Yellow Report estimates
- Pseudo-data grids used as inputs to study:
 - Unpolarised proton structure function extractions
 - Impact on collinear proton/nuclear PDFs

[Analysis note](#)

Proton F_2 & F_L

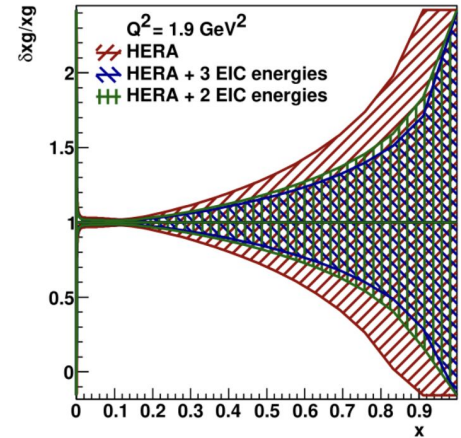
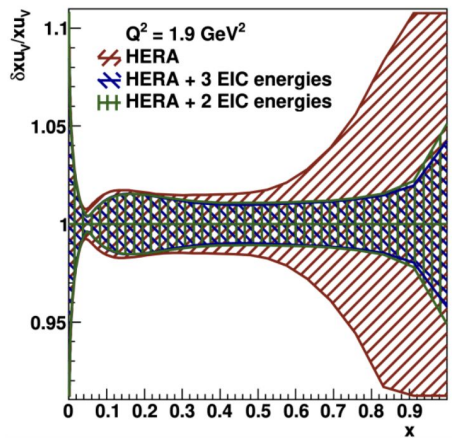
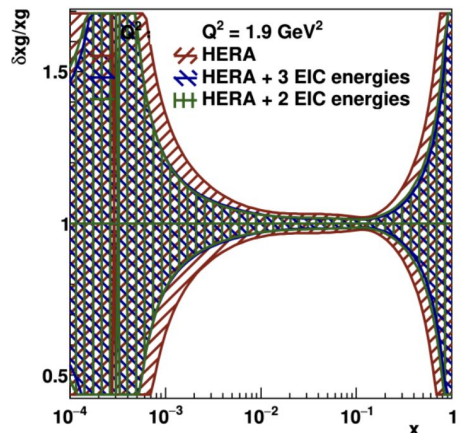
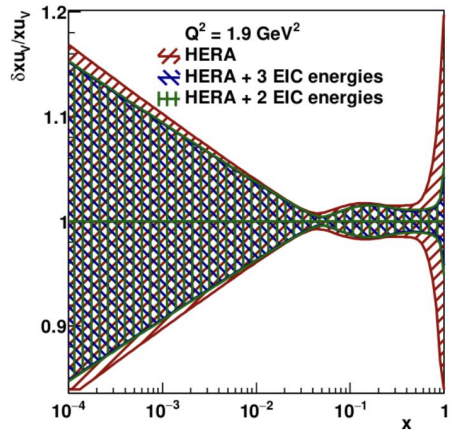


- Evaluated precision of model independent extraction of proton F_2 and F_L structure functions
- Evaluated impact of a 3rd e-p configuration for early science
 - Factor of ~ 5 - 8 x improvement for F_L uncertainties

Work by Javier Jiménez-López, Stephen Maple, Paul Newman, Katarzyna Wichmann

[arXiv:2602.00860](https://arxiv.org/abs/2602.00860)

Proton PDFs * featured in ESR



- Evaluate impact on **HERA-only fit**
 - Early science data not as powerful as full EIC dataset -> mainly impact u_v and g PDFs
 - Stronger impact at high- x where HERA data are statistically limited
- Consider also scenario with **lower energy (5GeV electron) run**
 - Difference small -> much more important for structure functions

Work by Javier Jiménez-López, Stephen Maple, Paul Newman, Katarzyna Wichmann

[arXiv:2602.00860](https://arxiv.org/abs/2602.00860)

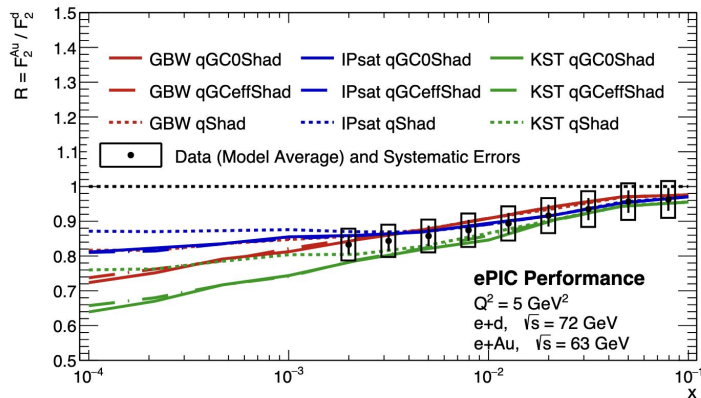
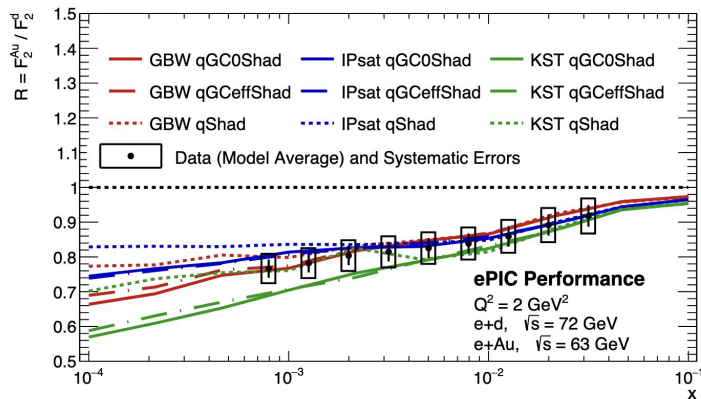
$$F_2^A / F_2^d$$

Work by Stephen Maple

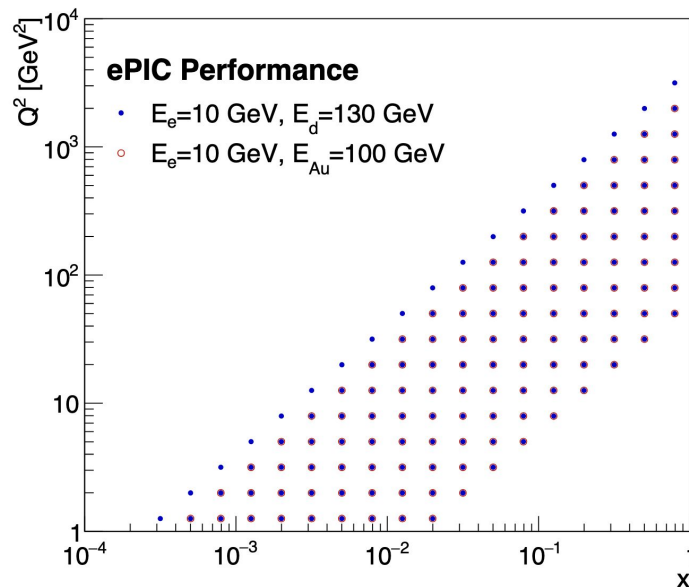


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Note: ignore lines -> will be replaced with nPDF prediction w/ error bands



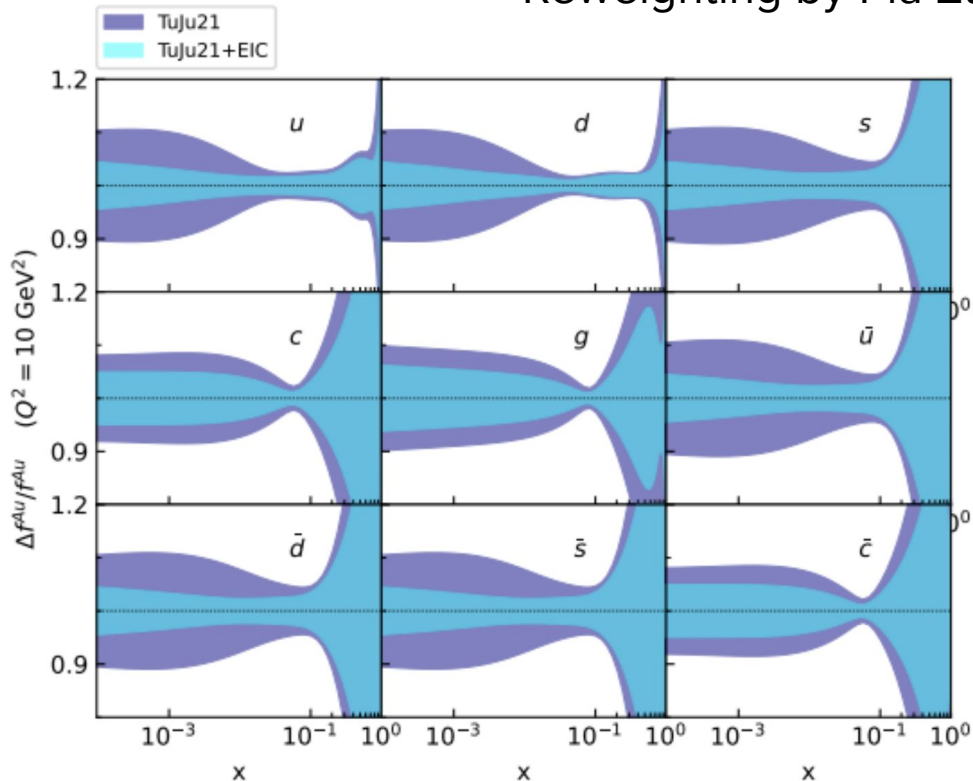
- Significant overlap in x - Q^2 phase-space for e-d and e-Au/e-Ag
- Can measure nuclear modification of F_2 over wide range in x and Q^2



[Analysis details](#)



e-Au xsec grids from Stephen Maple
 Reweighting by Pia Zurita



- Impact of e-Au pseudo-data on TUJU21 gold nPDF evaluated
 - Bayesian reweighting procedure with single e-Au early science configuration
- Extend DIS data for heavy nuclei down to $x \sim 10^{-3}$ -> significant improvement at low-x for all parton species!

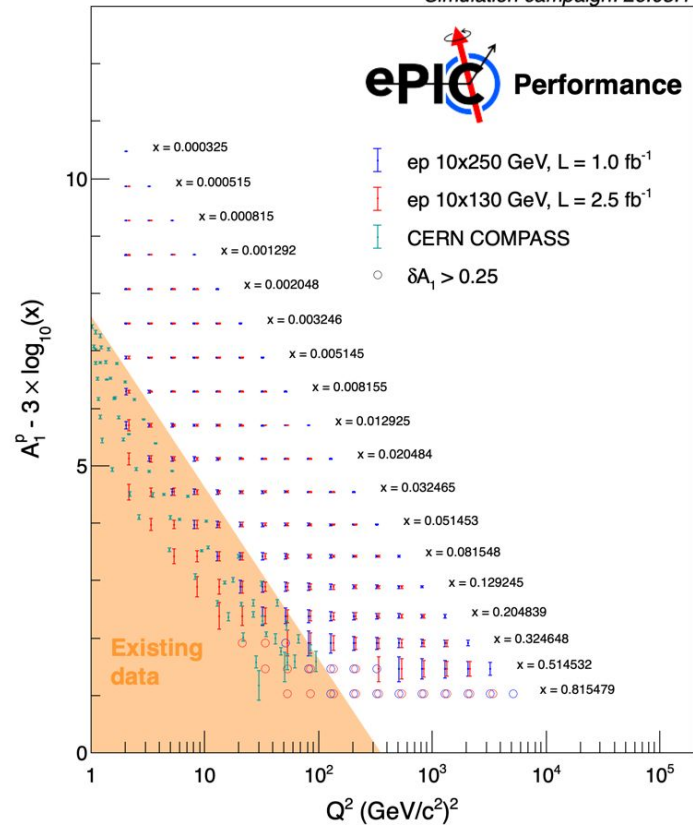
[Analysis details](#)

Double spin asymmetry

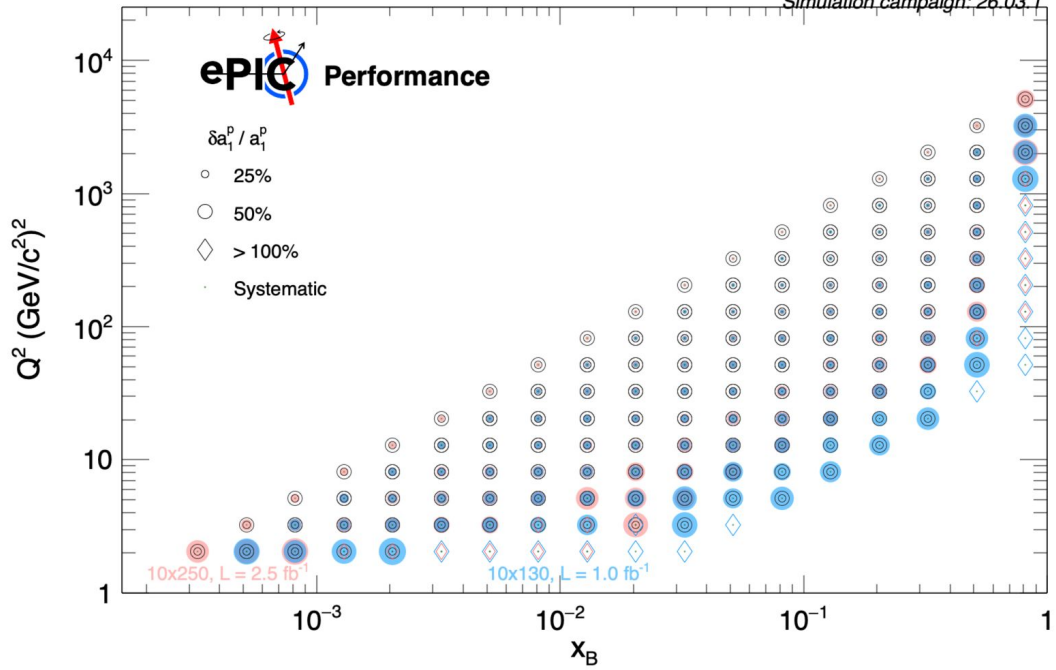
Work by Win Lin



Simulation campaign: 26.03.1



Simulation campaign: 26.03.1



- Systematics estimate includes 3.4% uncorrelated and 1.5% correlated uncertainties
- Asymmetry is statistically dominated

[Analysis note](#)

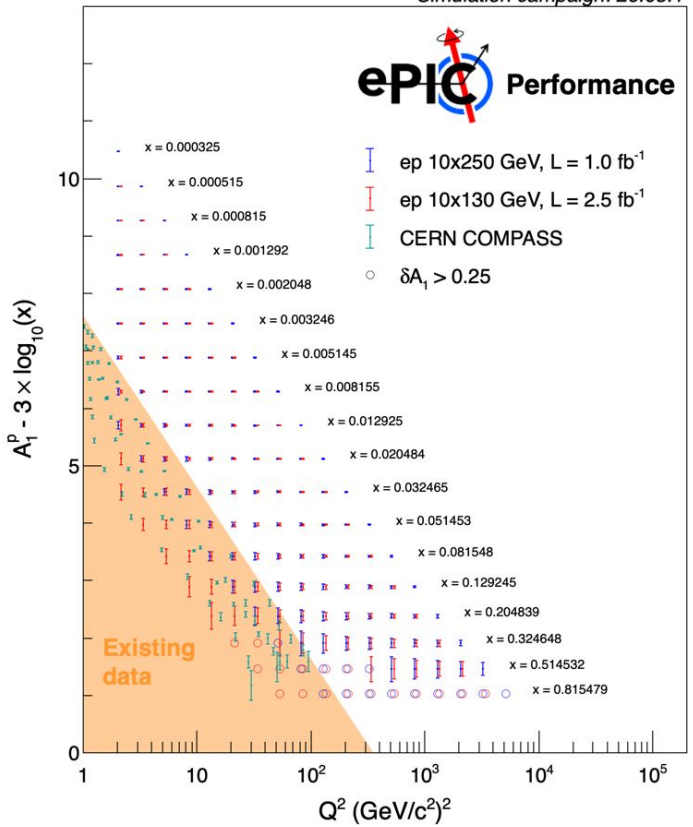


Double spin asymmetry

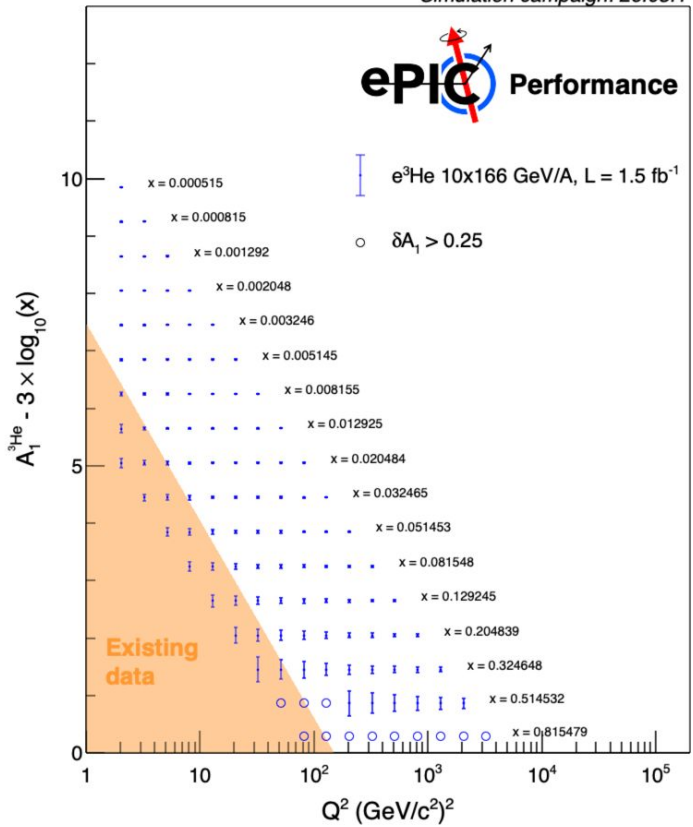
Work by Win Lin



Simulation campaign: 26.03.1



Simulation campaign: 26.03.1



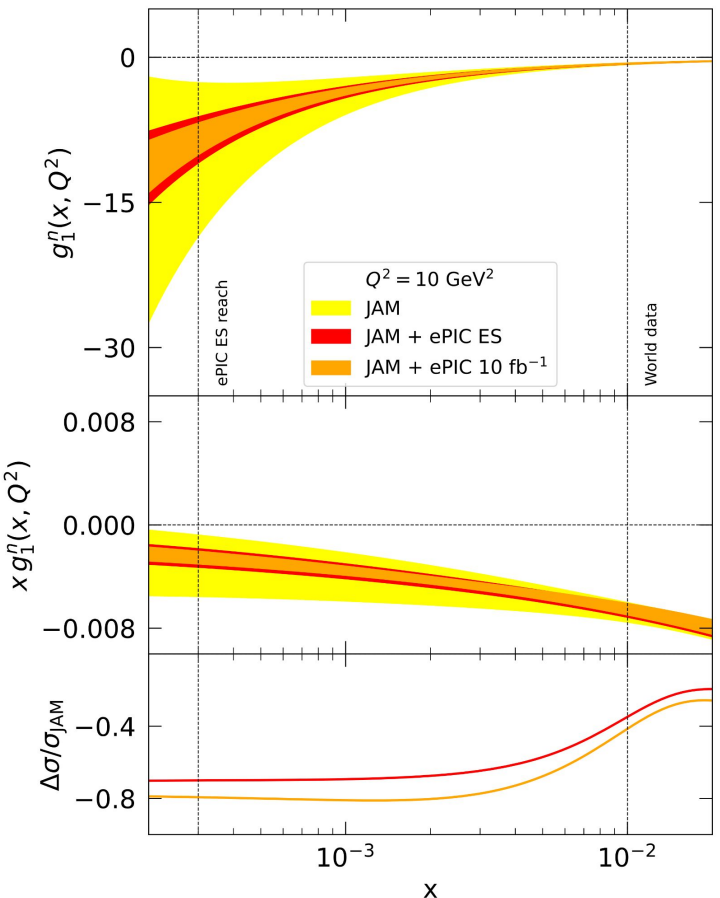
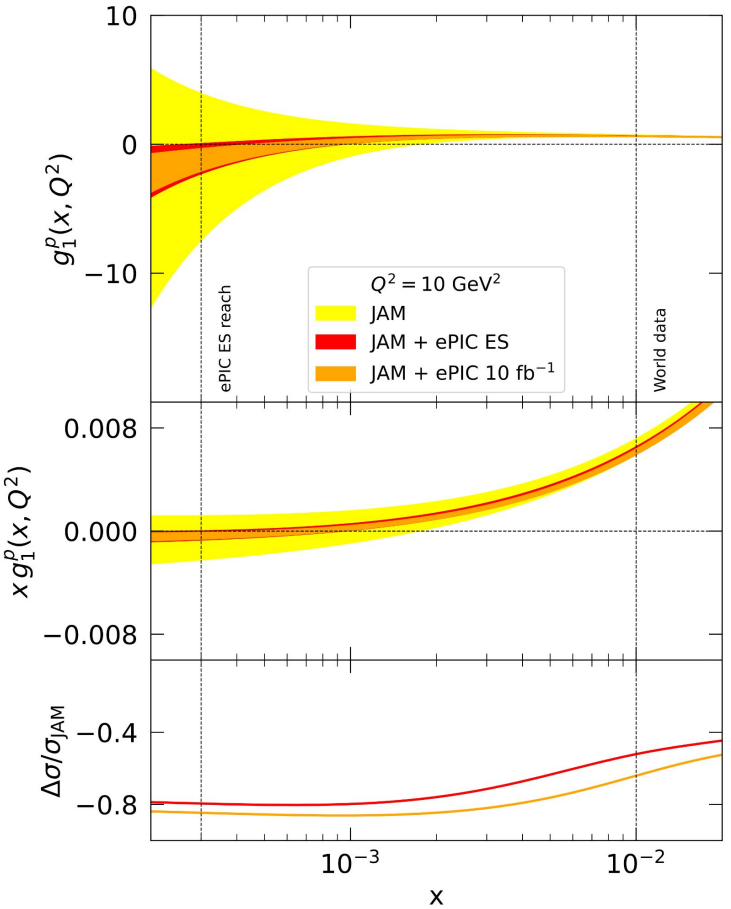
- Results from fully inclusive measurements
- Low x reach, covers wide range of new phase space
- A_1^p and A_1^n will both be available

Analysis note

g_1^p & g_1^n * featured in ESR



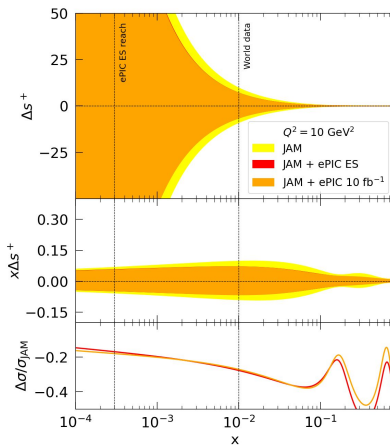
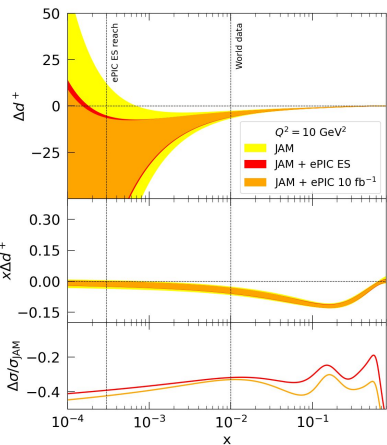
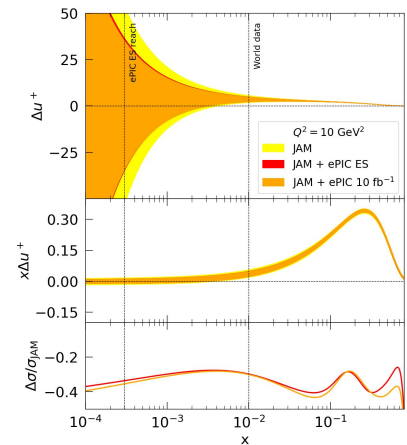
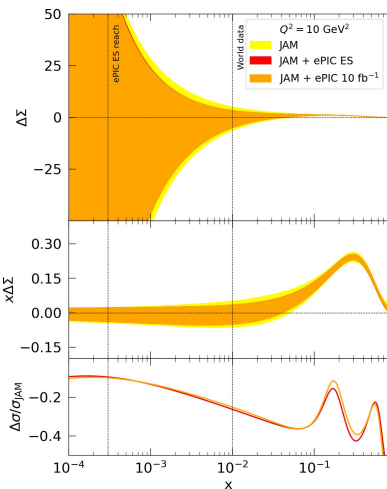
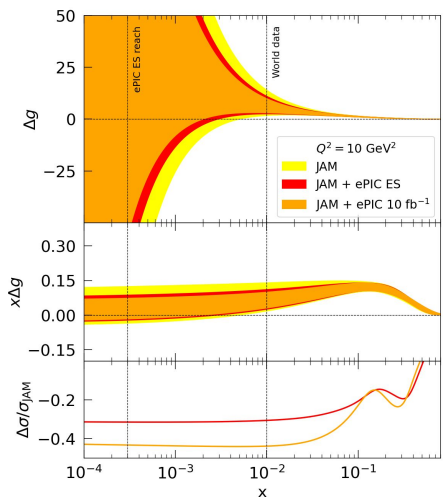
WILLIAM & MARY



- Impact on global fit using [JAM analysis](#)
- Extrapolation uncertainties to low x will be significantly reduced
- Ambiguity in sign of g_1^p and how fast g_1^n drops at low x will be resolved

Work by Win Lin, Christina Cocuzza

Helicity PDFs

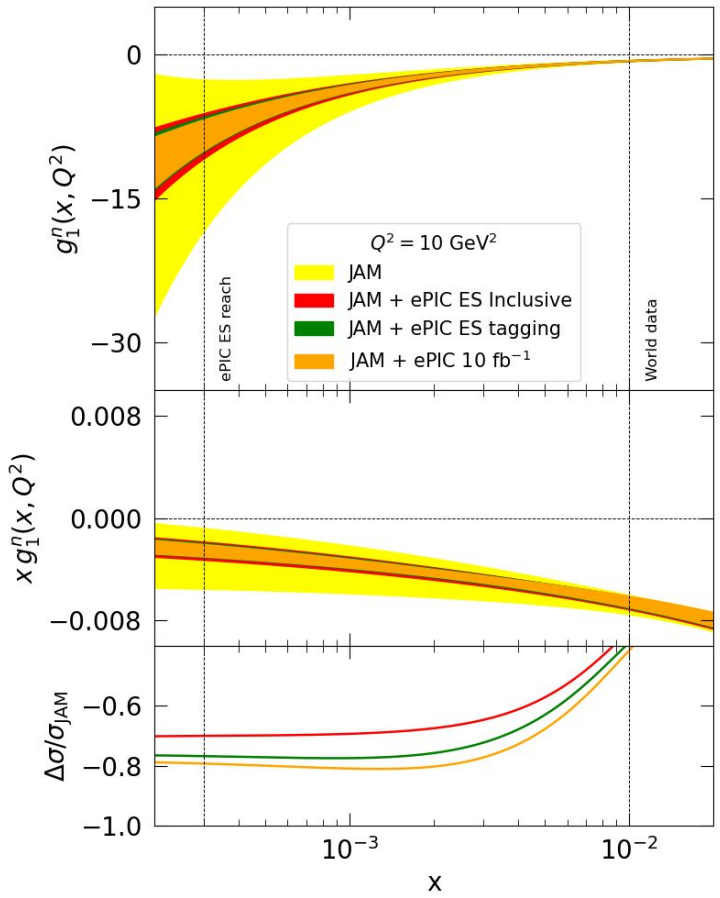
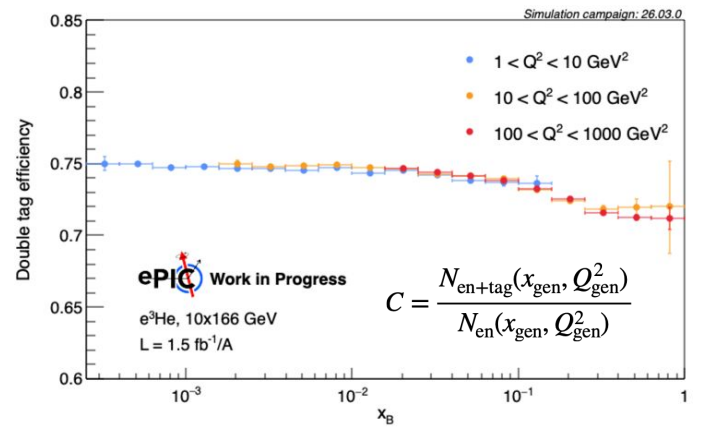
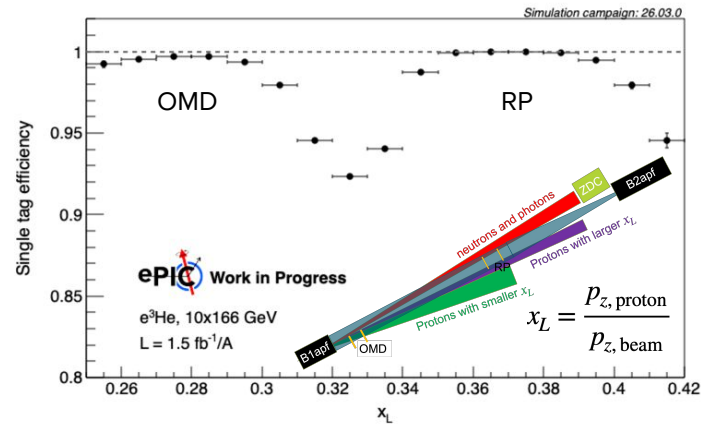


- Impact on global fit using [JAM analysis](#)
- Inclusive data will help constrain uncertainties at low x
- Waiting for inputs from more theory groups

Work by Win Lin,
Christina Cocuzza
[More fitted results](#)

e³He spectator tagging

Work by Win Lin



- Spectator tagging helps reduce model uncertainties and verify model of ³He
- OMD and RP positions are not yet optimized for e³He. Will be improved soon
- Currently using hit-based tagging algorithm. Tracking and tagging with ZDC are expected to help improve tagging efficiency

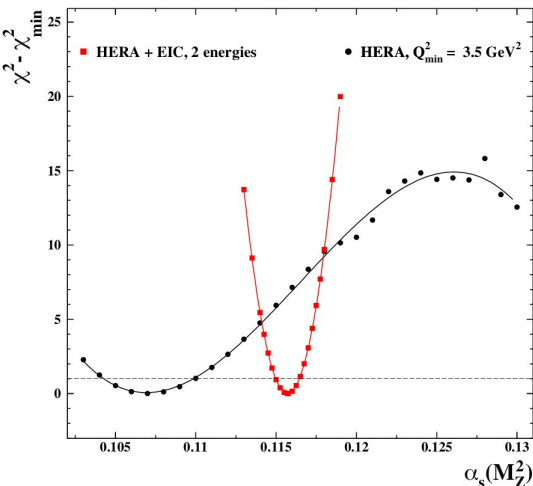
[Recent update](#)



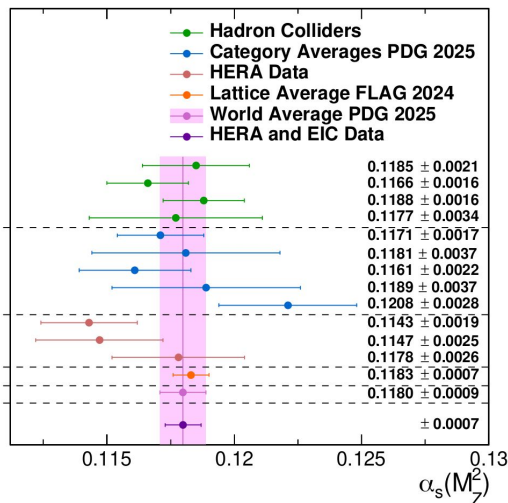
Strong coupling constant, α_s^* featured in ESR



HERA and EIC



ATLAS ATEEC
 CMS Jets
 W, Z Inclusive
 tt Inclusive
 τ Decays
 QQ Bound States
 PDF Fits
 e* e Jets and Shapes
 Electroweak Fit
 ZEUS Inclusive + Jet Data
 H1 Inclusive + Jet Data
 H1 and ZEUS Jet Data
 Lattice Average
 World Average
 HERA and EIC Early Science
 Inclusive Data (exp)



- Extraction by simultaneous fit of PDFs and α_s
- Demonstrate potential for high precision extraction of α_s using only HERA and EIC Early Science inclusive data

Work by Javier Jiménez-López, Stephen Maple, Paul Newman, Katarzyna Wichmann

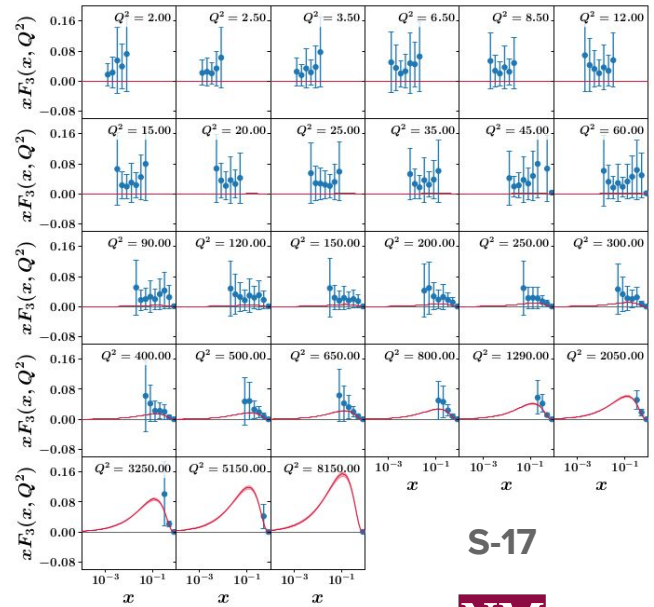
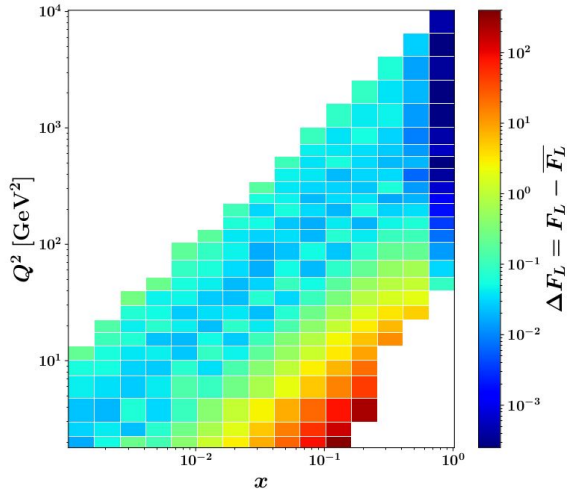
[arXiv:2602.00860](https://arxiv.org/abs/2602.00860)

- Extraction from the Q^2 dependence of the Bjorken sum will provide complementary determination of α_s
- Proposed for ECCE, projection for ePIC will be available very soon (work by Bennett Lamb, Xiaochao Zheng)



Outlook for full running & coming soon studies

- Proton g2 (Alexey Vladimirov, Guillermo Portela Maller, Win Lin, Christina Cocuzza)
- Simultaneous extraction of F_2 , F_L , $x F_3$ (Javier Jiménez-López w/ Katarzyna Wichmann, Stephen Maple)



S-17



- Show importance of accounting for F_3 to avoid bias in extractions of F_L/F_2
- If we want to extract F_3 at EIC then require large number of beam configurations (or positrons)

[Analysis details](#)

- g3cc, g5cc (Churamani Paudel, David Ruth)
- F1yz, F3yz, g1yz, g5yz (Sayak Chatterjee, Krishna Kumar)

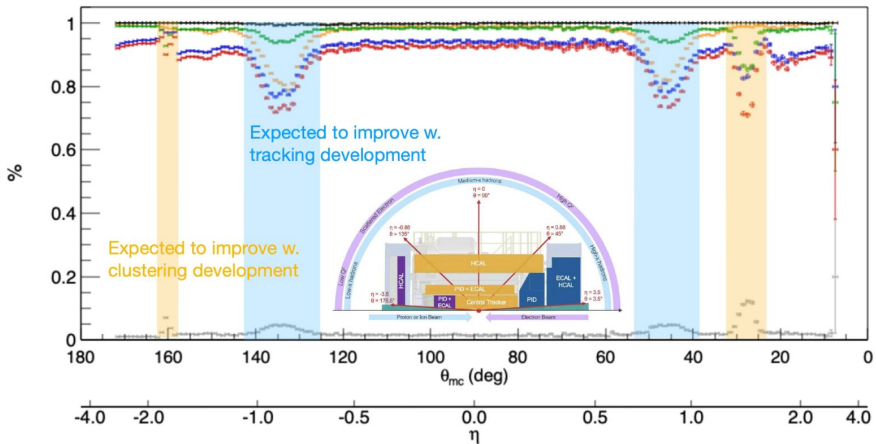


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eID development

Work by Matilda Donlan, Arthur Guest, Stephen Maple, Win Lin



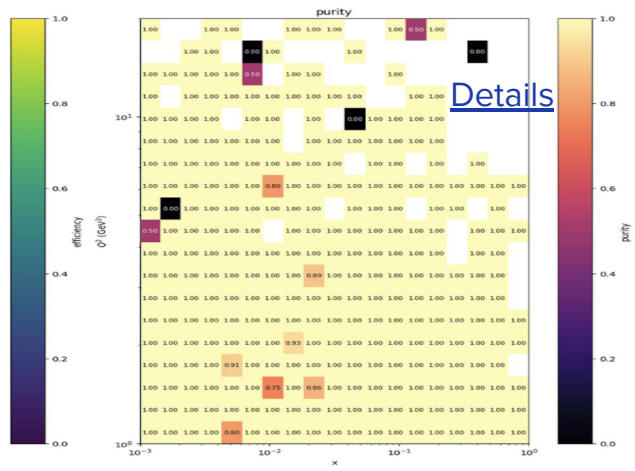
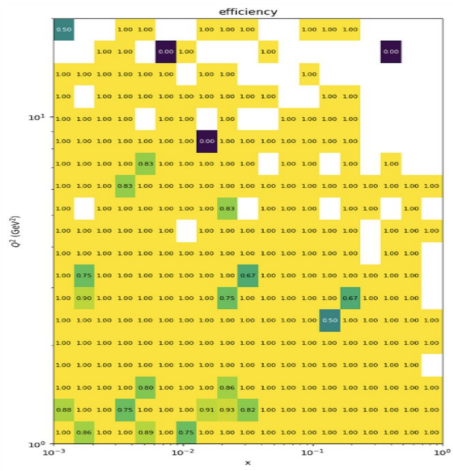
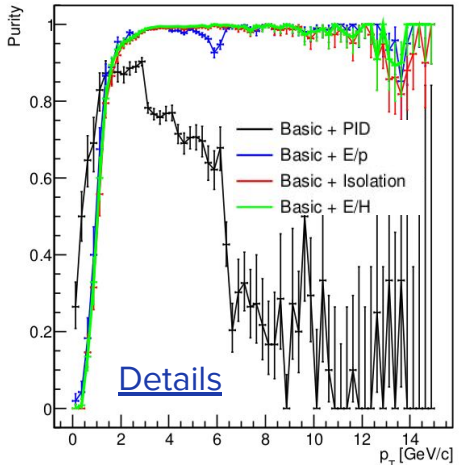
ePIC Work in Progress

$ep, 10 \times 100 \text{ GeV}$

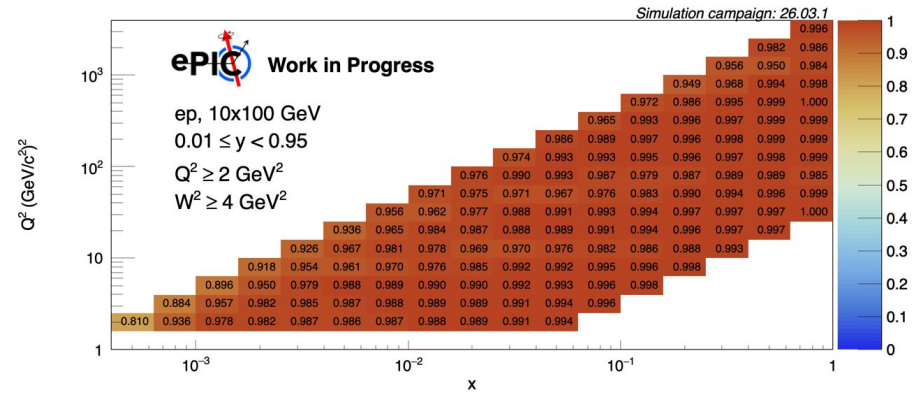
- e track eff.
- e cluster eff.
- eID efficiency
- eID purity
- Overall eID rate
- Contamination

- Current algorithm relies on E/p and highest p_t , which requires availability and good resolution of both tracks and clusters
- Exploring new set of selection criteria
- ML model for eID is being developed

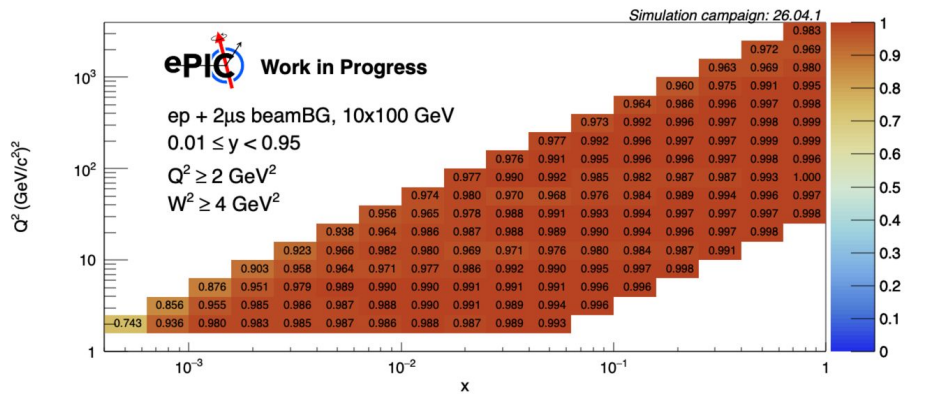
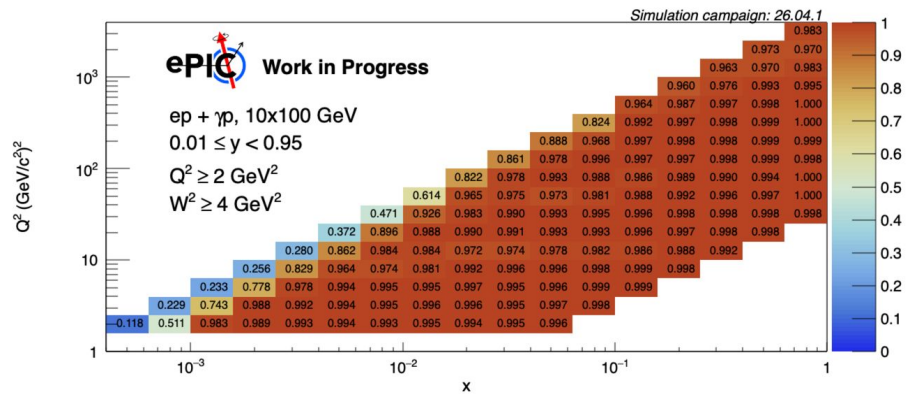
[Details](#)



eID background study



- Shown are changes in purity when low Q^2 events and beam background are added to DIS signal sample
- Impacts are mostly in the backward, high y, low x region
- Expect better performance with pID detectors added to algorithm



Recent update

Summary



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Thank you!
Join us at our biweekly meeting
on Wednesday 11AM :)