

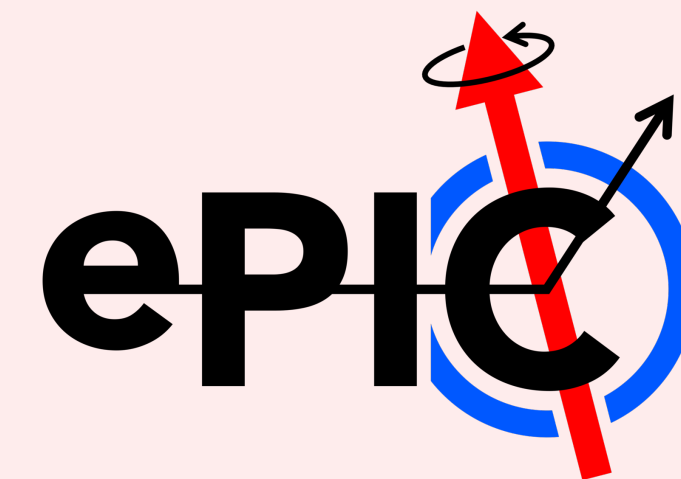
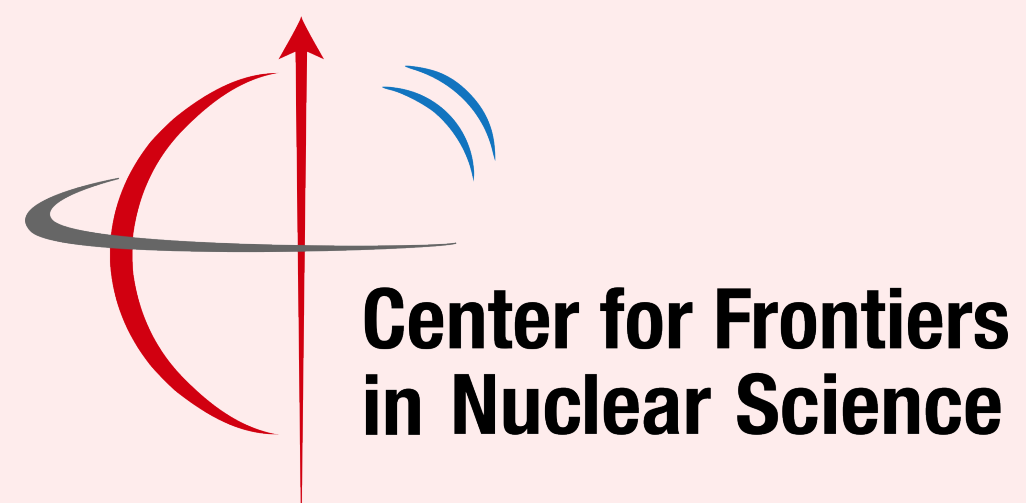
Latest progress on eHe3 Double Spectator Tagging

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Joint ePIC/EICUG Meeting

07/15/2026



Origin of nucleon spin

Strong

- $A_1^{p,n}$ and $g_1^{p,n}$
- Gluon helicity PDFs

Strong

- Sivers A_{UT}
- Collins asymmetries
- Quark helicity PDFs

Important

- Spectator-tagged $A_1(n)$
- GPD constraints on OAM

Supporting

- Δg from charm/jets
- Hadron-in-jet Collins FF

Motivation for A_1^n measurement:

- Nucleon spin structure, g_1
- Bjorken Sum, Γ_1^{p-n}
- Strong coupling constant, α_s
- Helicity PDF, $\Delta\Sigma$, ΔG

Motivation for tagging:

- Reduce uncertainty in A_1^n
- Test ^3He nuclear model

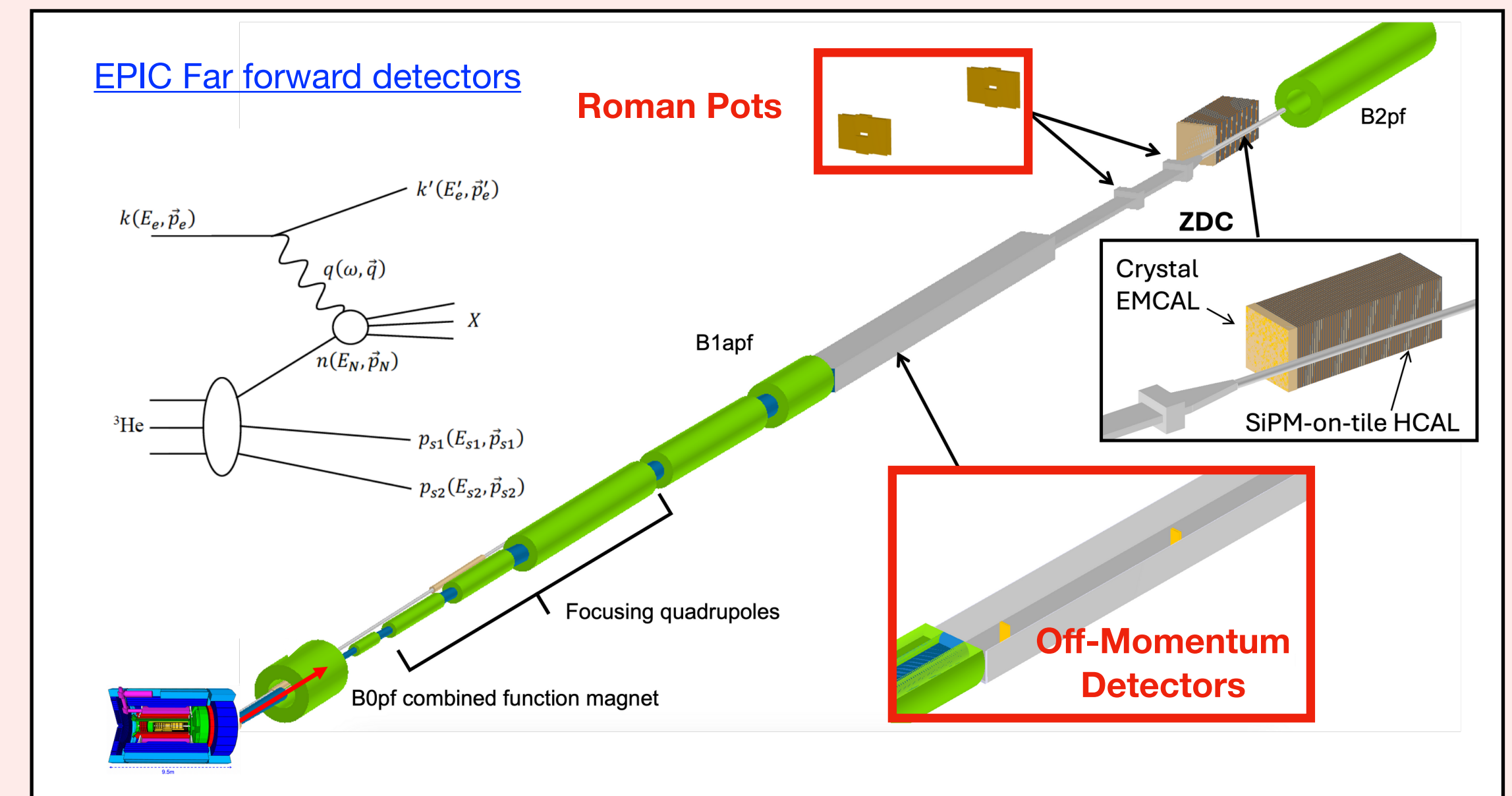
More details

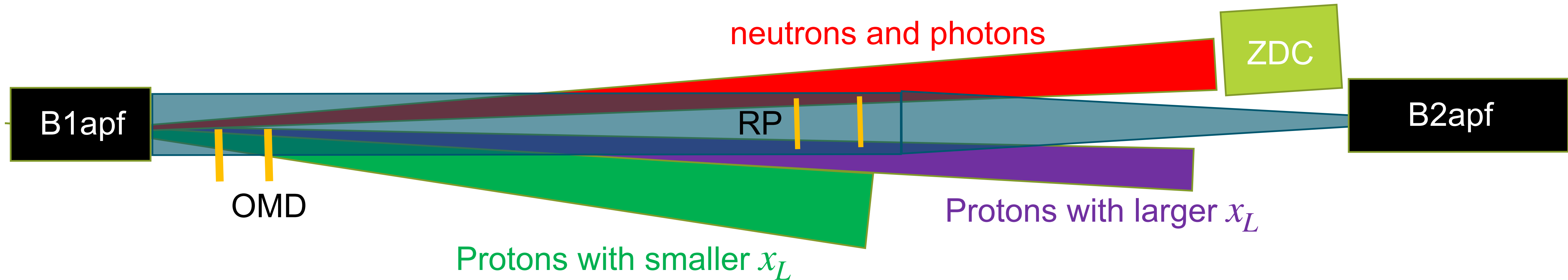
Two ways of measuring A_1^n :

- can be extracted from $A_1^{^3\text{He}} = P_n \frac{F_2^n}{F_2^{^3\text{He}}} A_1^n + 2P_p \frac{F_2^p}{F_2^{^3\text{He}}} A_1^p$

$$P_n = 0.86 \pm 0.02 \quad P_p = -0.028 \pm 0.004$$

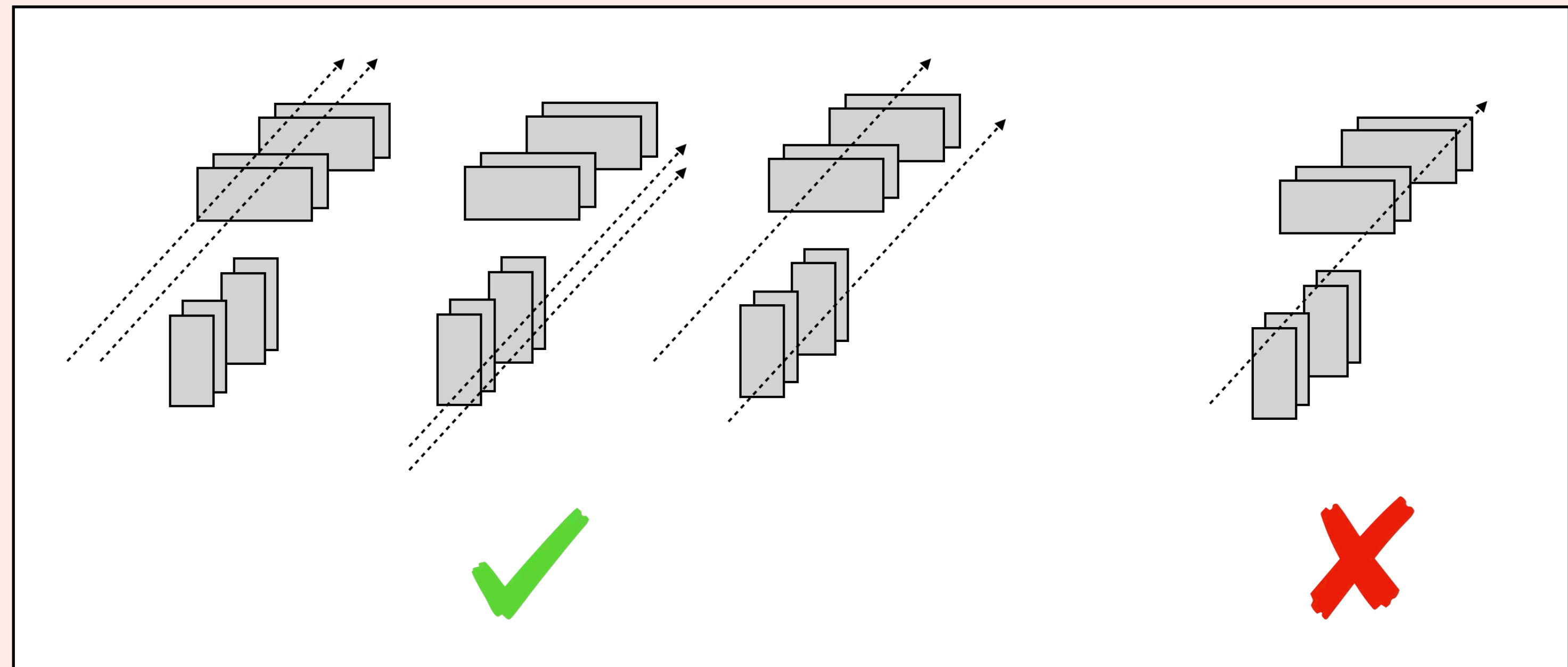
- and measured **directly** from double spectator tagging:



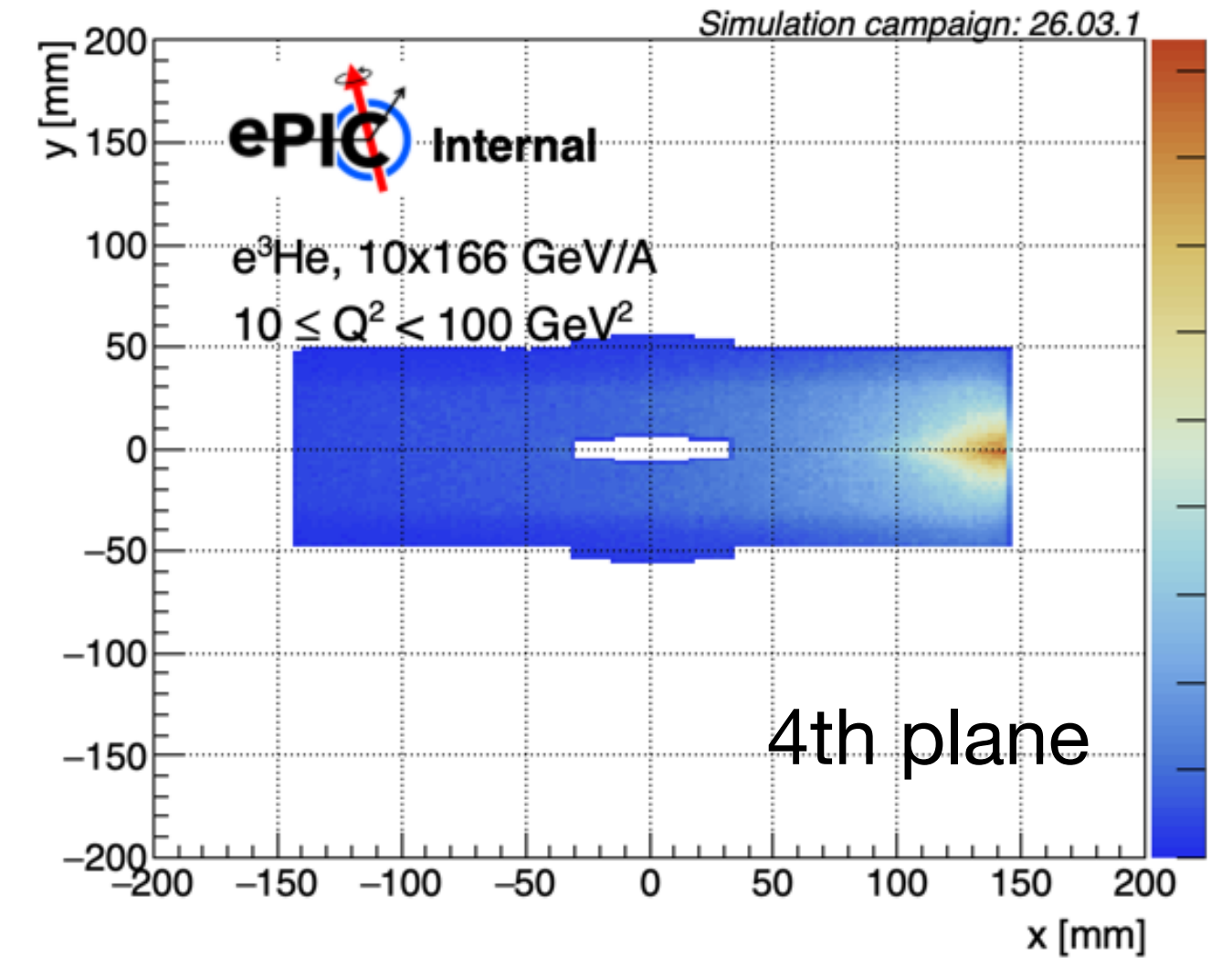
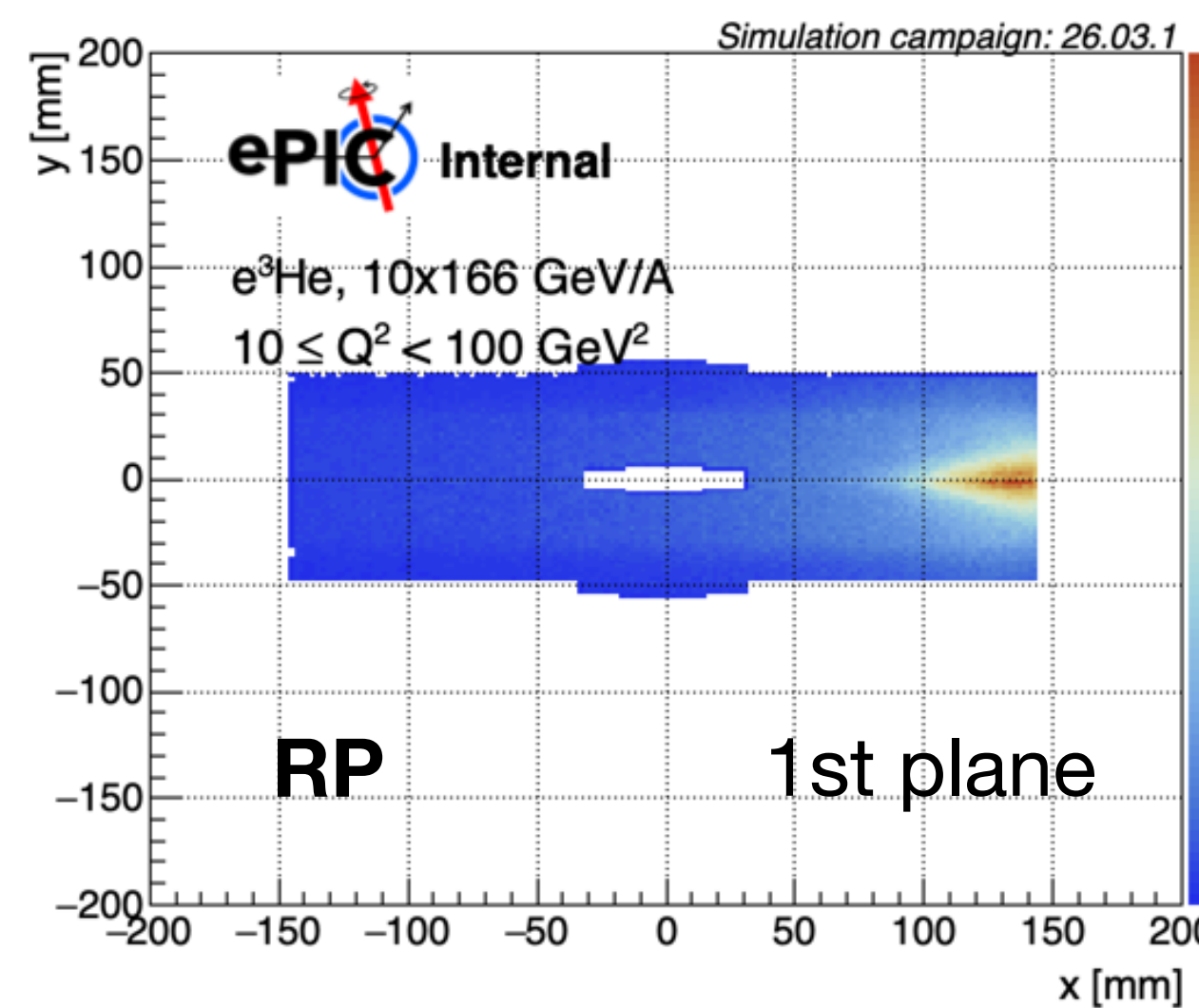
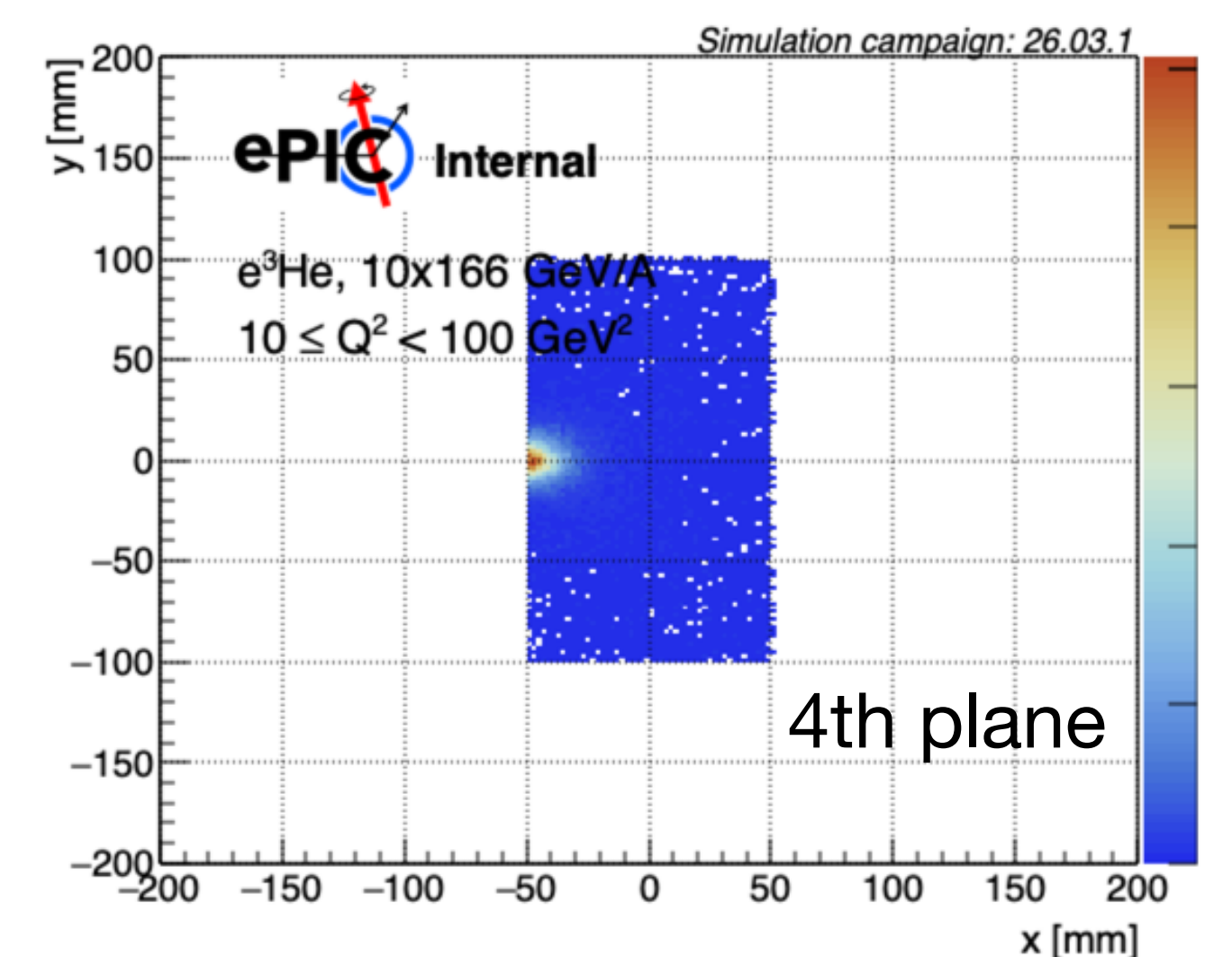
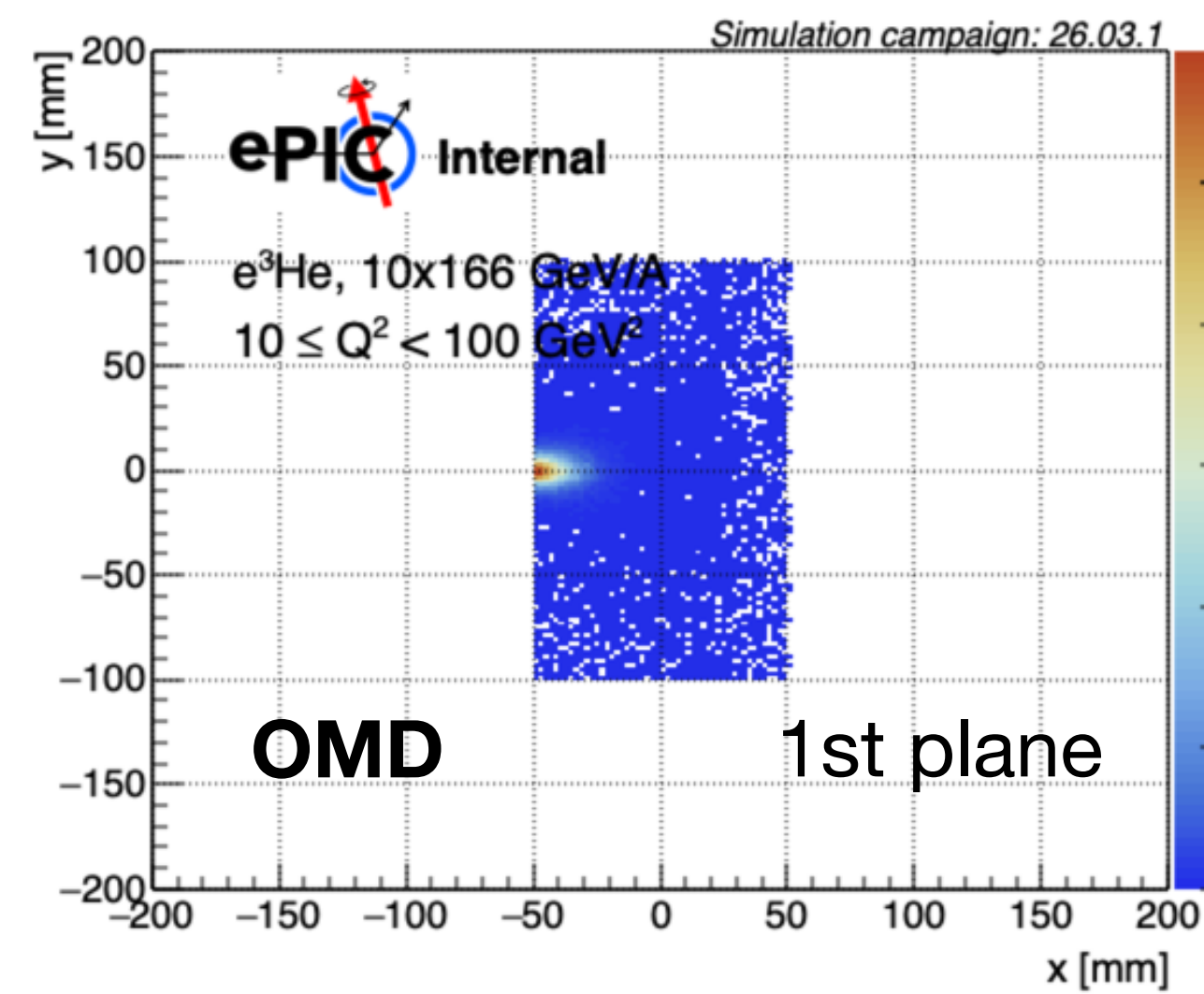
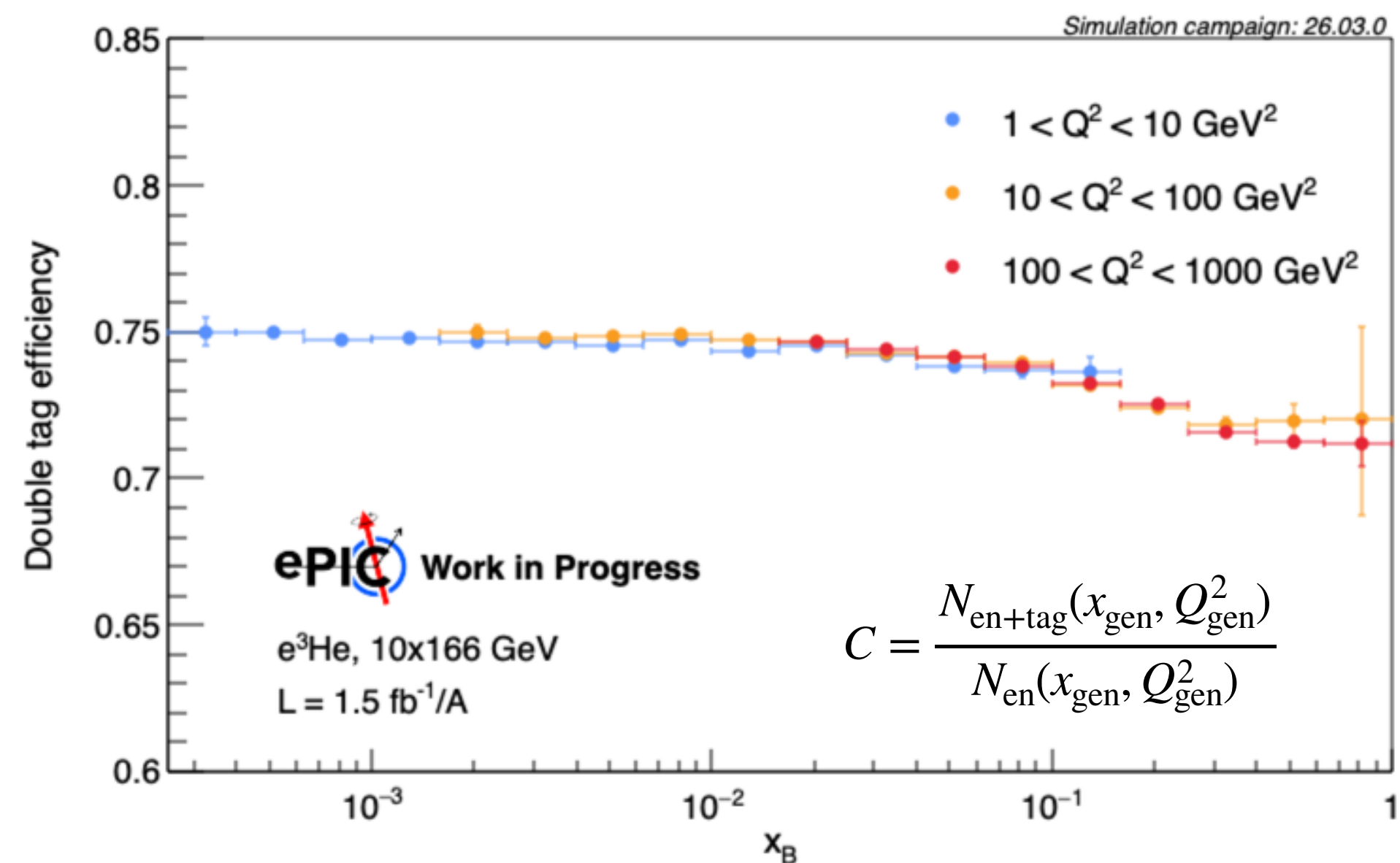
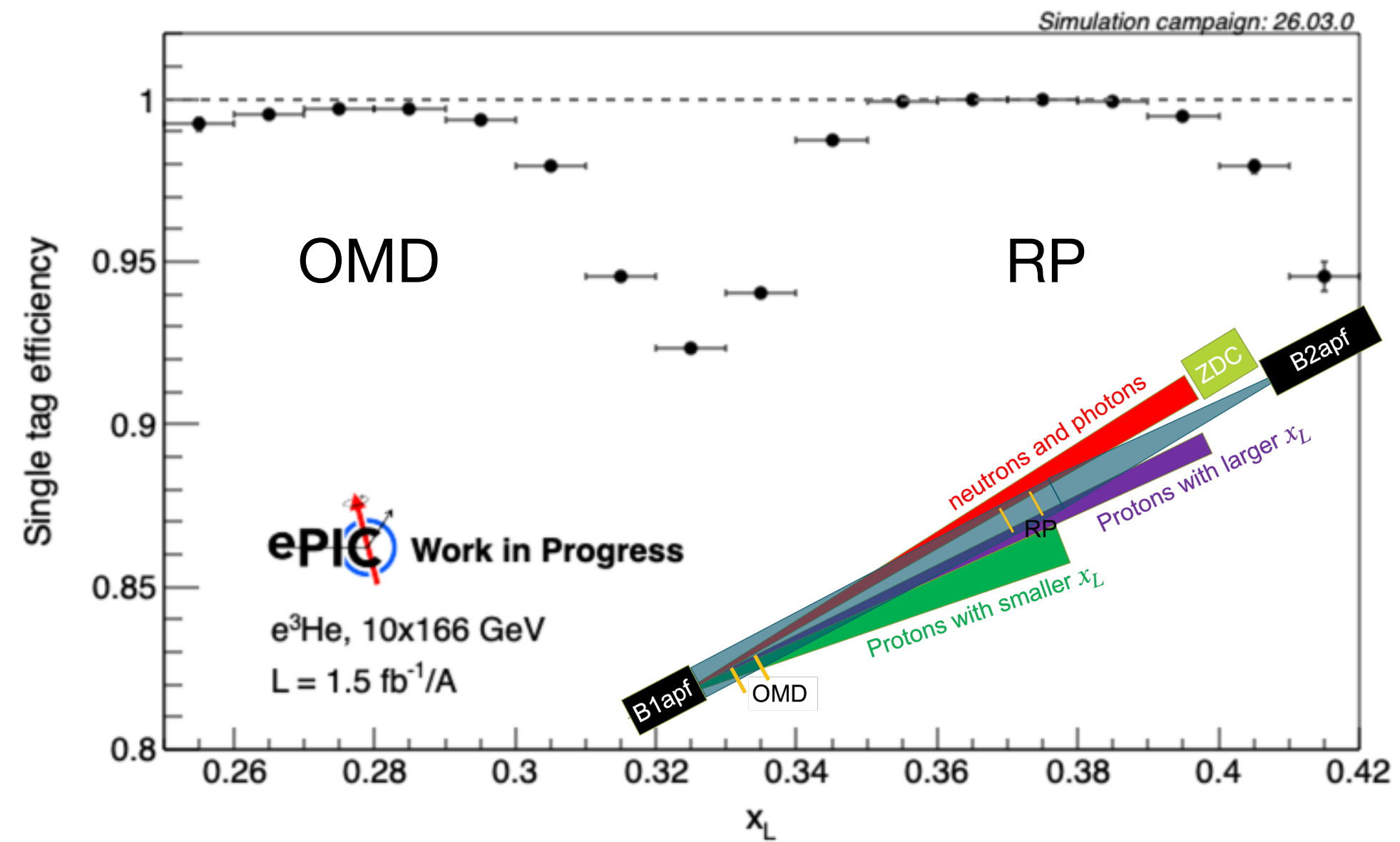


Currently using a hit-based tagging algorithm:

- ▶ Number of proton tracks = min number of hits per plane per detector
- ▶ If number of proton tracks ≥ 2 , then tag as double spectators
- ▶ Track-based algorithm is under development

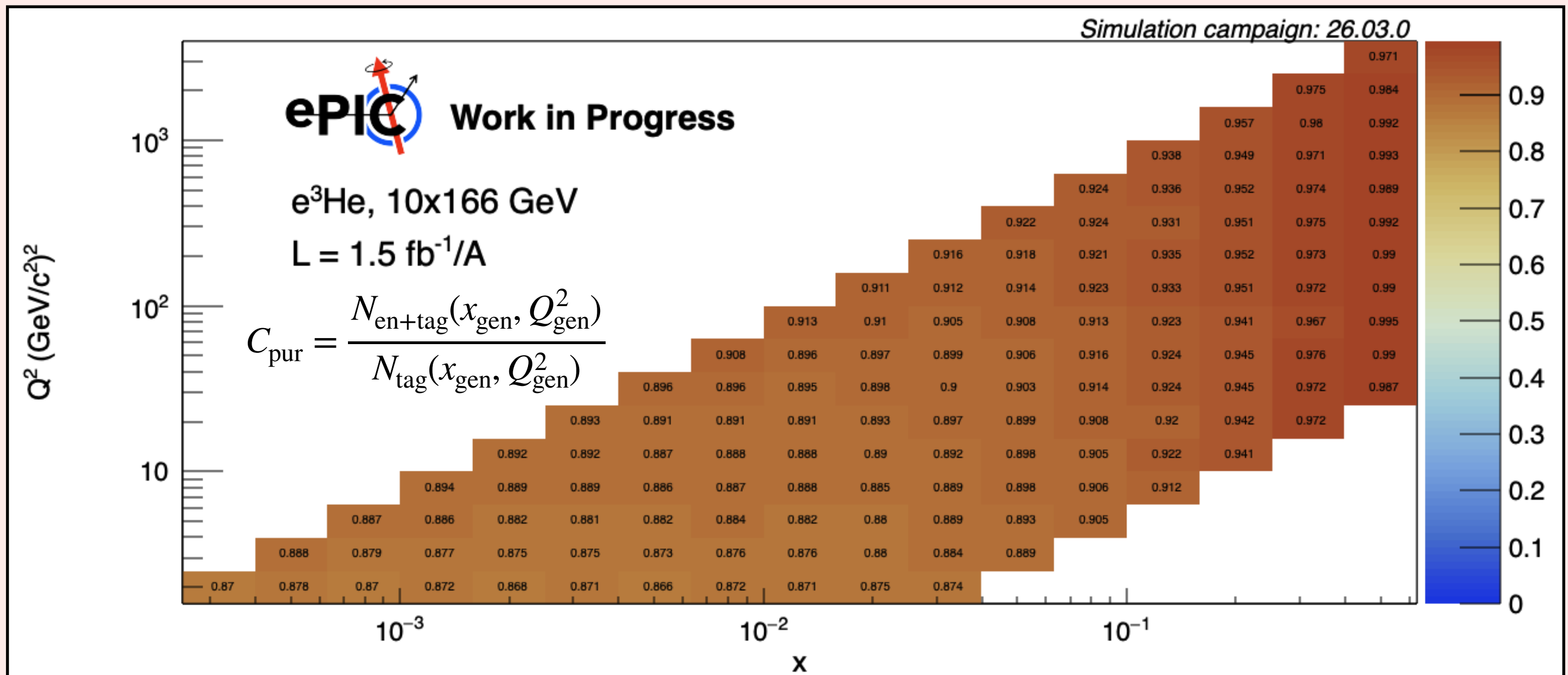
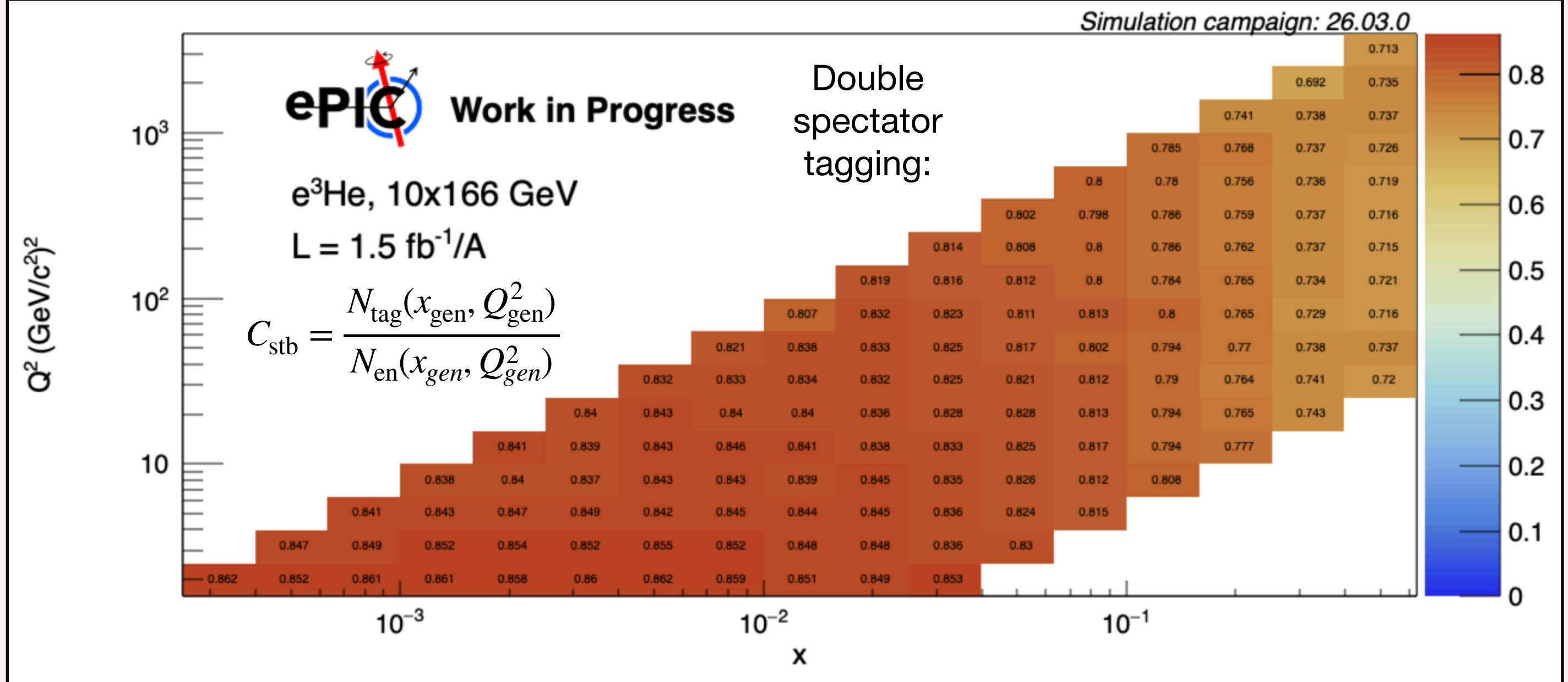
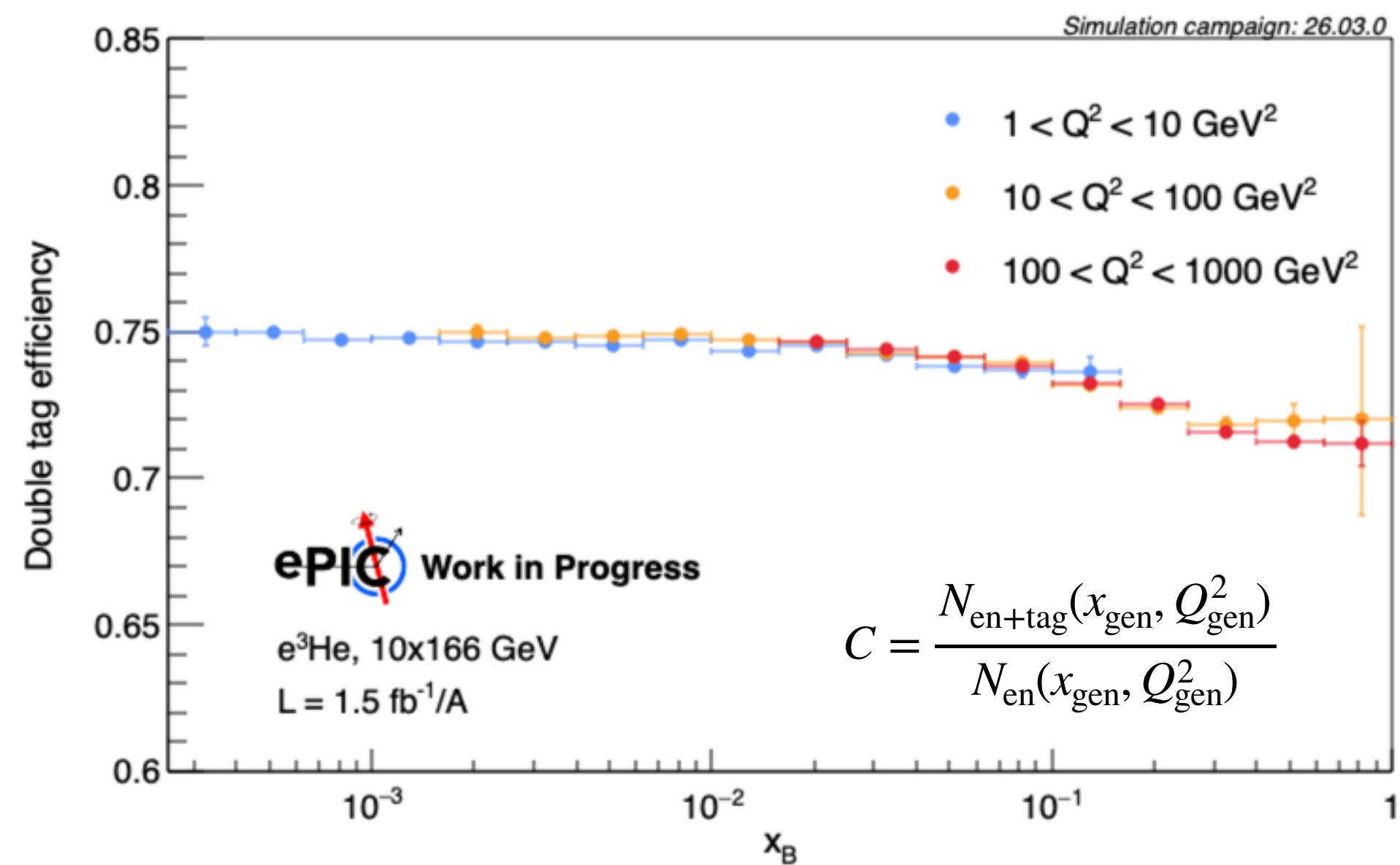
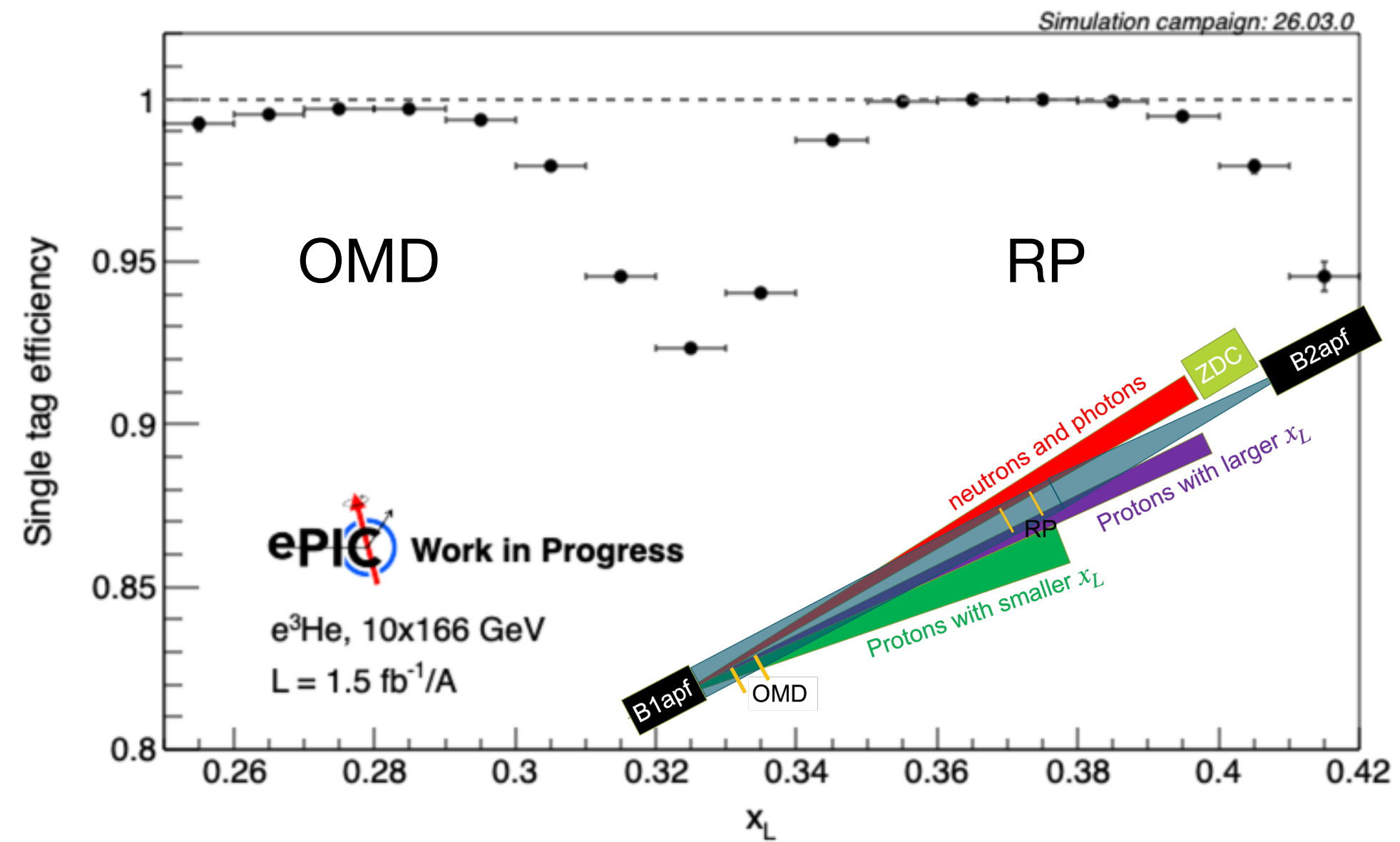


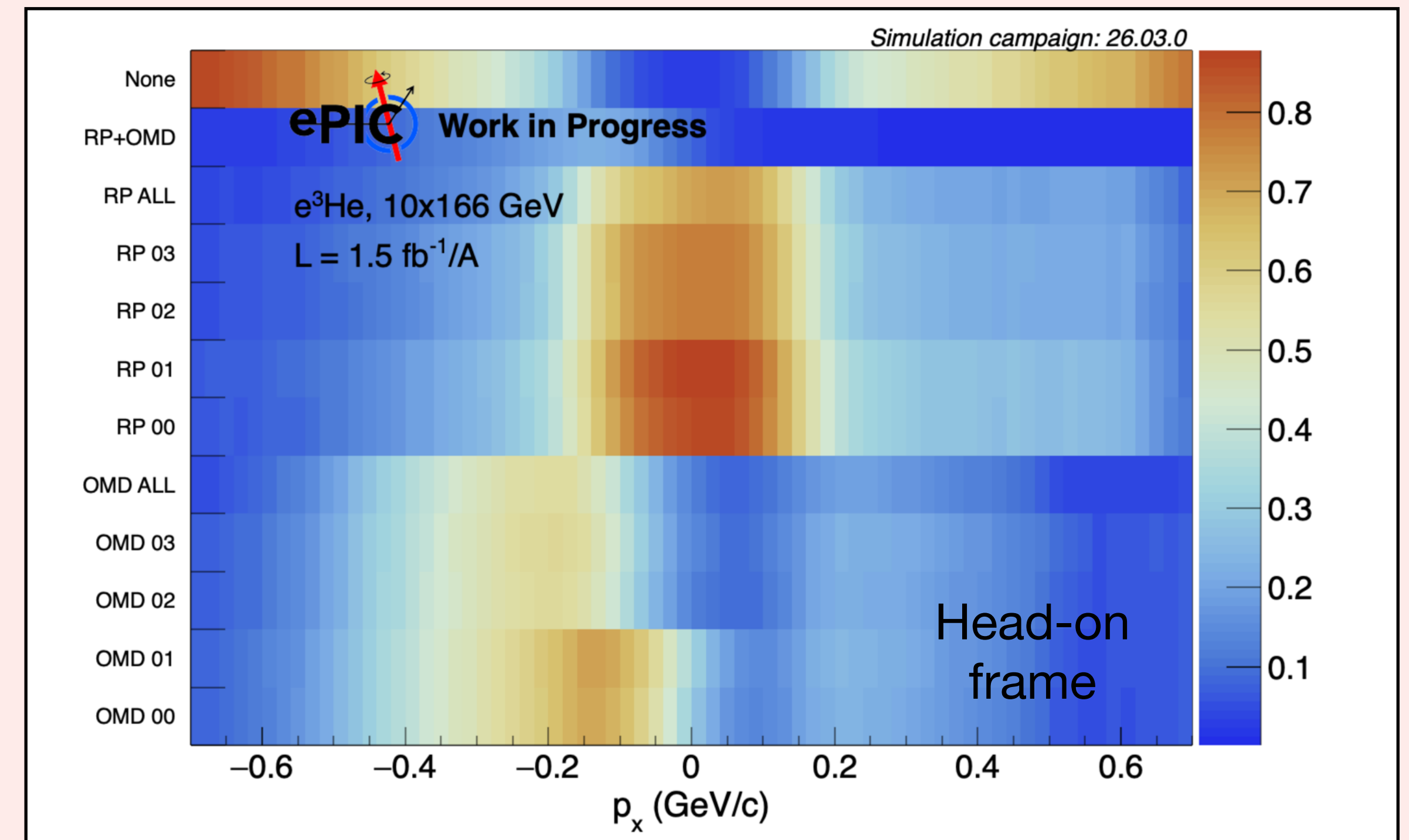
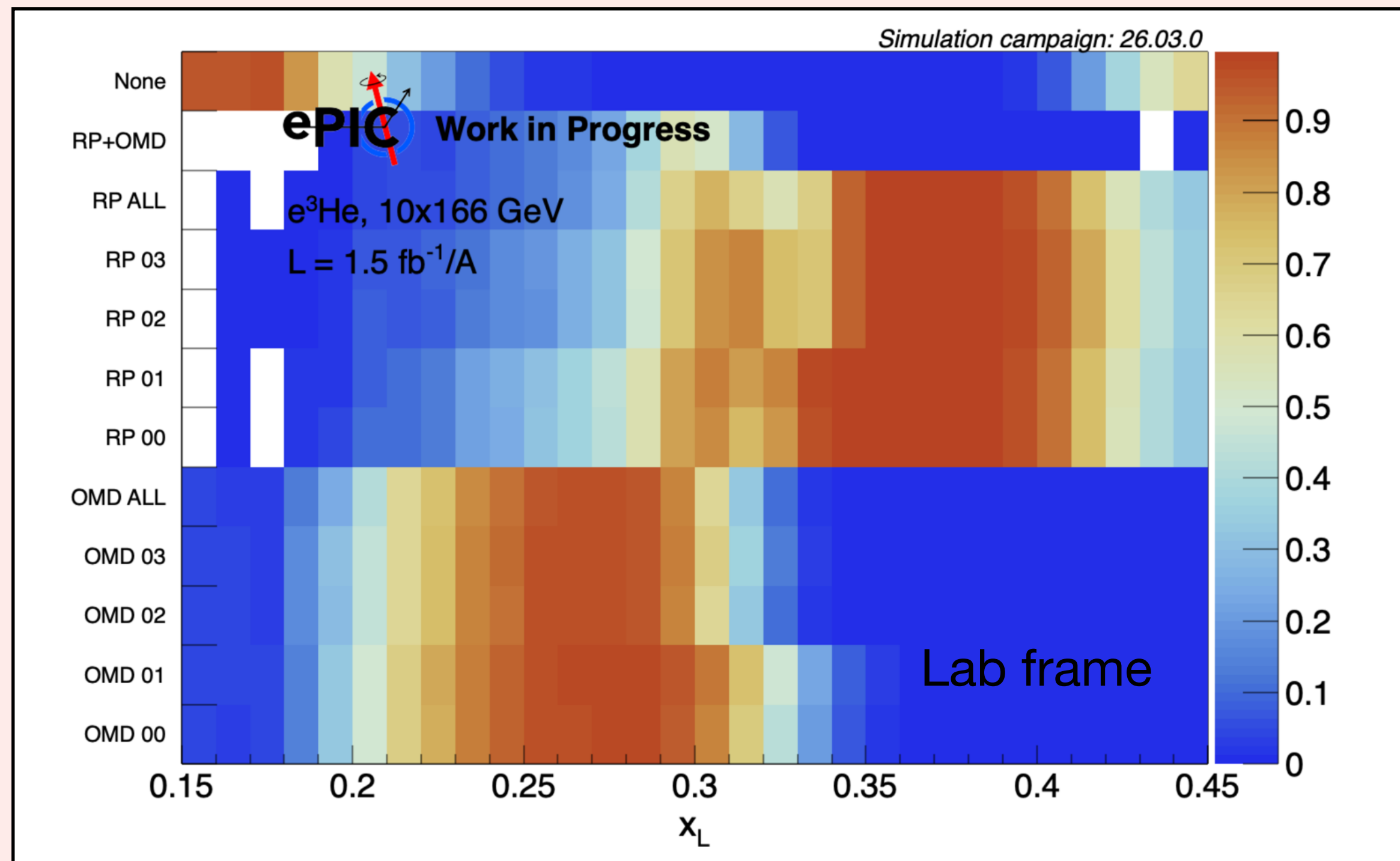
Tagging performance



away from IP $\longrightarrow$

Tagging performance



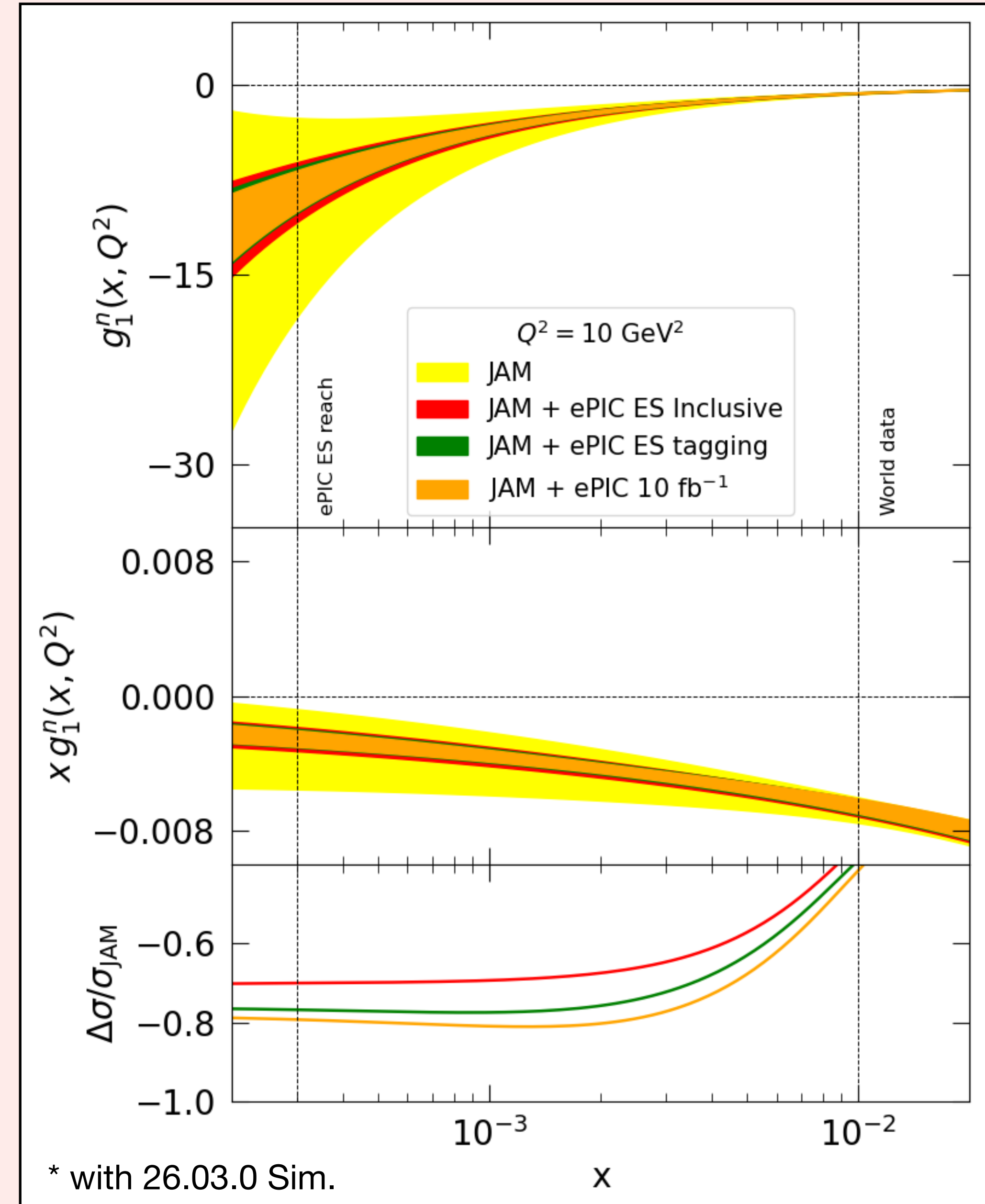
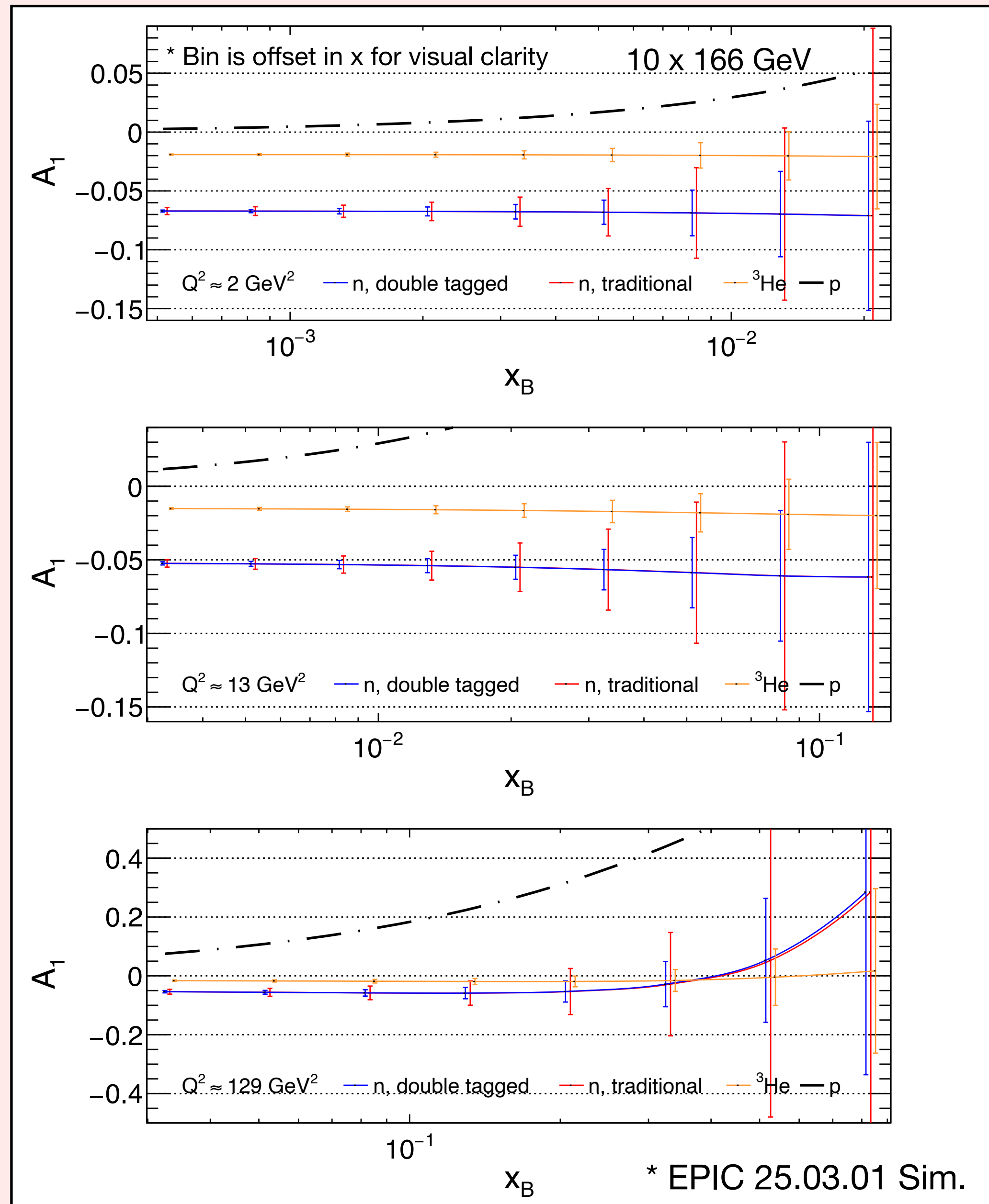


Limitation on current analysis:

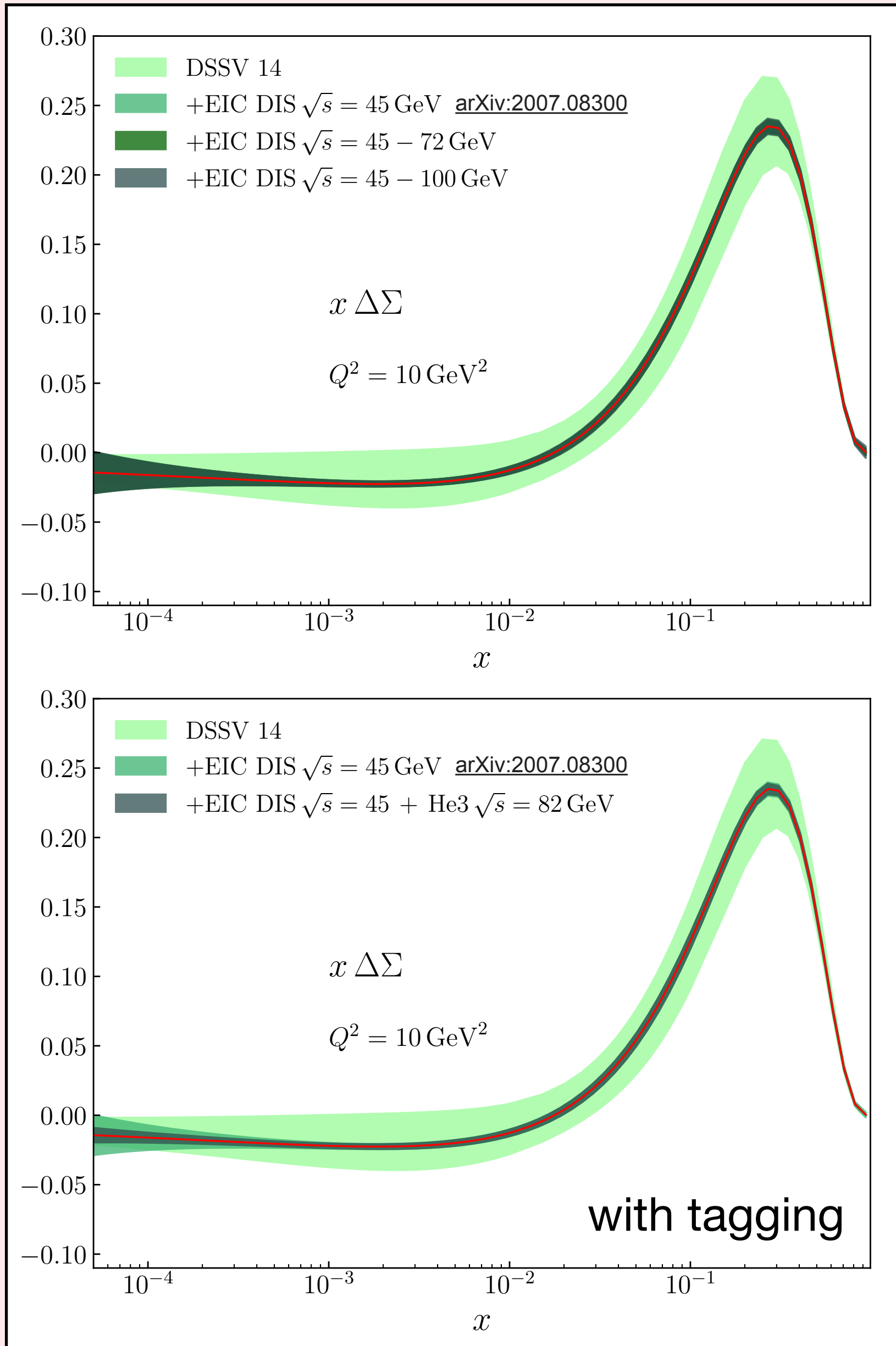
- ▶ Current simulation campaign (< 26.06) files used older eic-smear. One or both spectators are sometimes missing for ep scattering
 - ➡ 26.07 campaign should be using most up to date eic-smear
- ▶ OMD position is not optimized for eHe3 scattering
 - ➡ Alex J. Is updating this

—————→ Tagging efficiency and purity will change

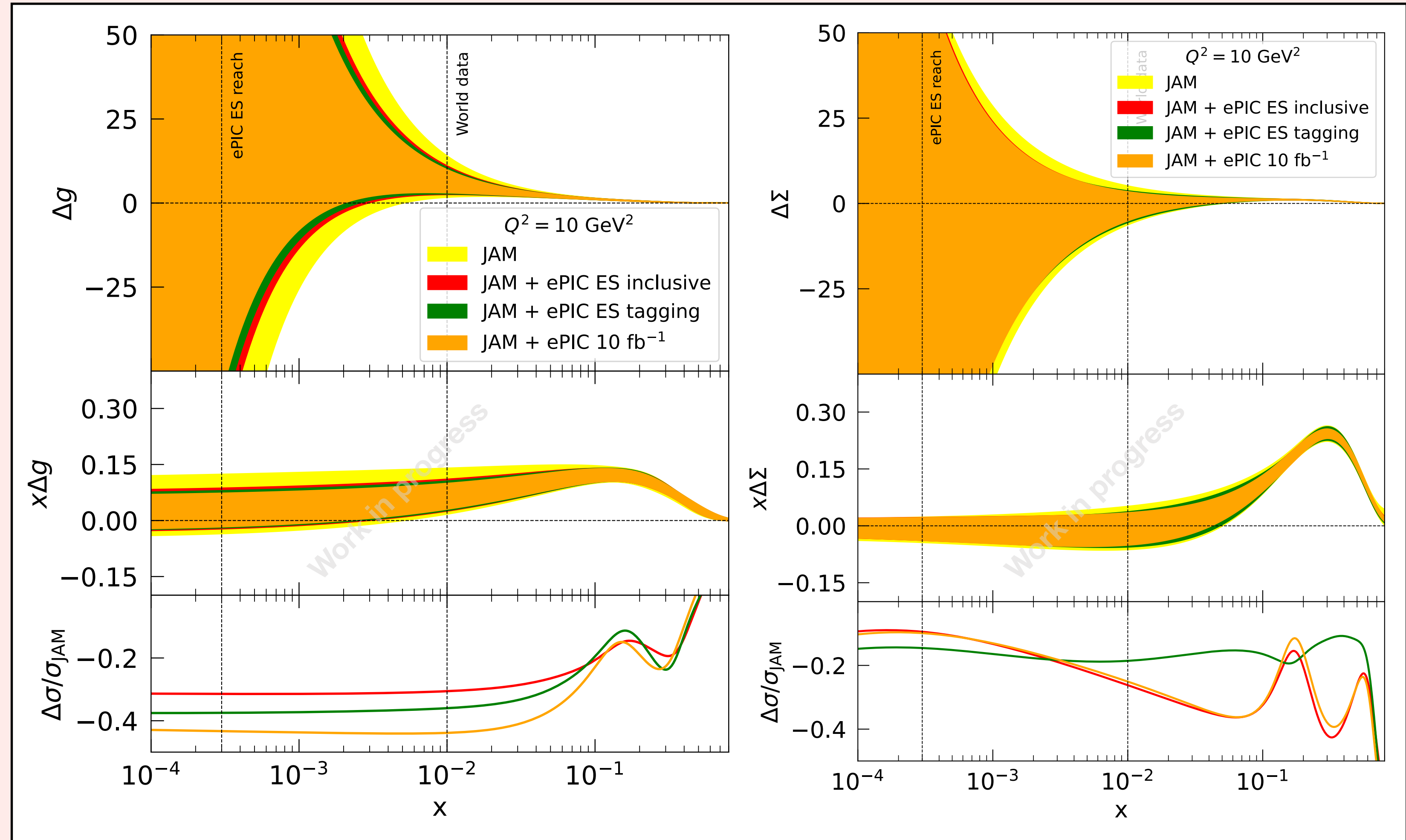
Projected impact



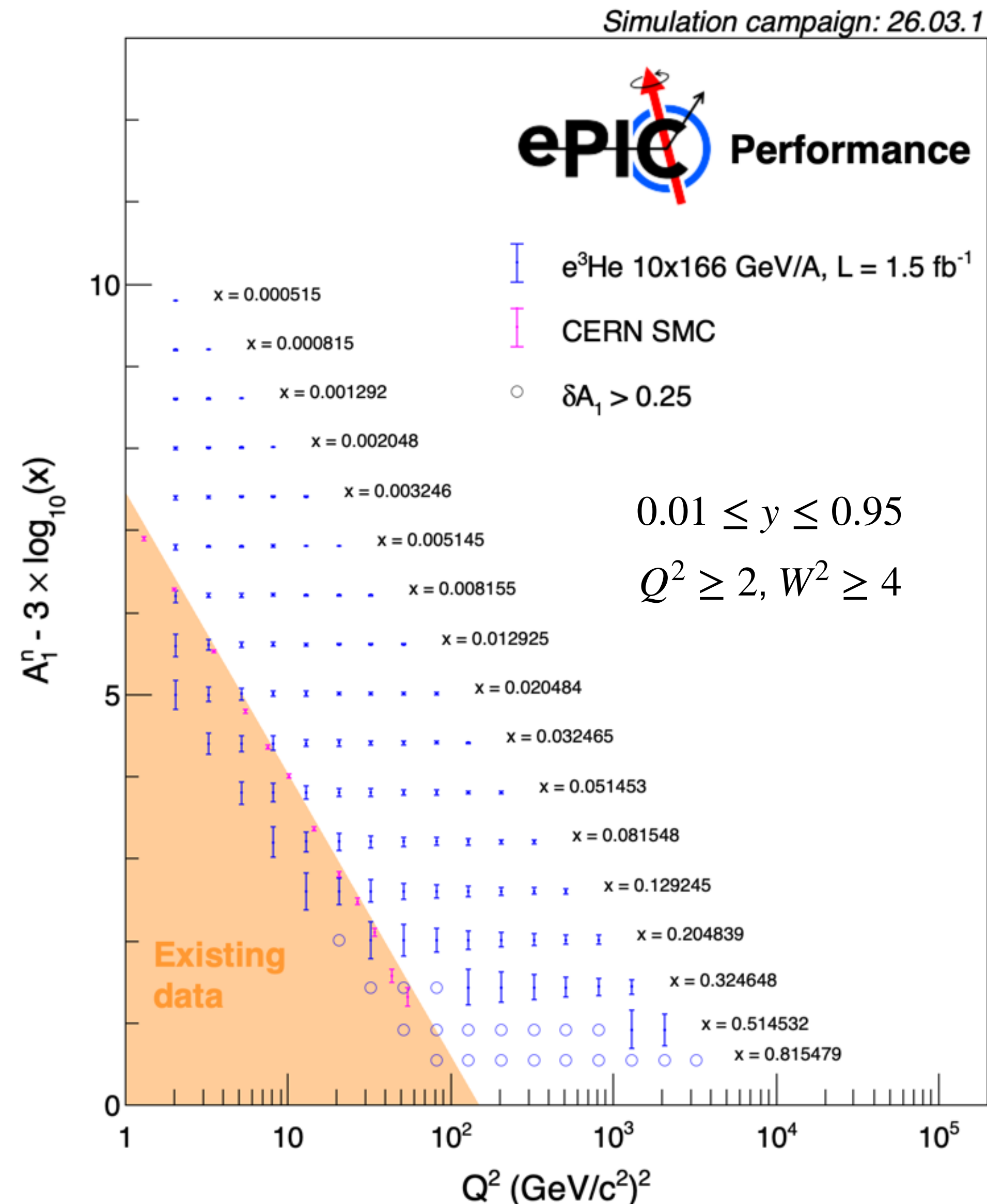
Projected impact



JAM global analysis: C. Cocuzza <https://doi.org/10.1103/6fn9-1wqb>



► Bjorken sum and α_s projections are coming soon.



- Preliminary results demonstrate feasibility of double spectator tagging for $e^3\text{He}$ DIS
- Coming soon simulation updates will give better projections on tagging efficiency and purity
- Potential large uncertainty reduction in A_1^n and g_1^n by doing double spectator tagging

eID update will be shown tomorrow:

Electron finding with tracking + calorimetry

🕒 11:05 AM - 11:25 AM
📍 Lecture Theatre 466 (Gilbert Scott Building)



Oct. 19th - 23rd, 2026

<https://indico.cfnssbu.physics.sunysb.edu/event/668/overview>