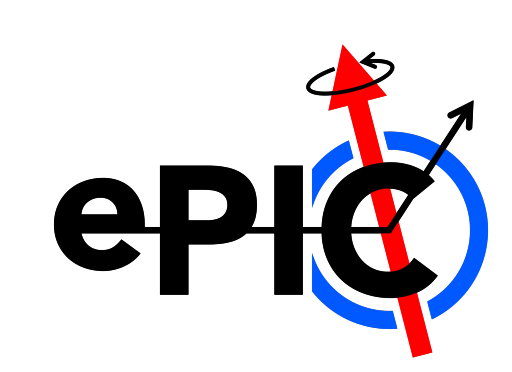




Scattered Electron-jet azimuthal correlations in $e+p$ and $e+Au$ collisions

(Stat. Uncert. Projection for ep and July eAu campaign analysis)

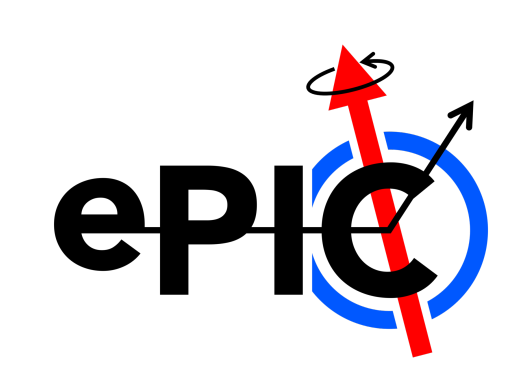
Mounika Choppalli (PhD student)

Nihar Ranjan Sahoo

IISER Tirupati, India



Jets-HF Working Group, 22 September 2026



Previous presentations

30th Jun 2026 presentation:

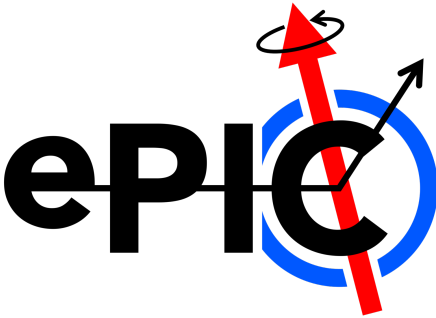
https://indico.bnl.gov/event/30270/contributions/126495/attachments/71070/121775/EICJetAndHF_30Jun2026.pdf

14th July 2026:

https://indico.bnl.gov/event/30271/contributions/126853/attachments/71318/122252/EIC_eJetCorr_14Jul2026_NRS.pdf

28 jul 2026:

https://indico.bnl.gov/event/33658/contributions/127484/attachments/71675/122862/EIC_eJetCorr_28Jul2026.pdf



Stitching all Q^2 bins for e+p events

Stitching all three Q^2 intervals done:

$$Y(\Delta\phi) \equiv \frac{1}{N_{e'}} \frac{dN_{\text{jet}}}{d(\Delta\phi)} = \frac{\sum w_i \frac{dN_{\text{jet},i}}{d(\Delta\phi)}}{\sum w_i N_{e',i}} \quad w_i = \frac{\sigma_i}{N_i^{\text{gen}}}$$

σ_i : Cross-section of each Q^2 interval

N_i^{gen} : Generated event in each Q^2 interval

First we stitched all Q^2 intervals

Then projected stat. Uncer. for $\int L dt = 1 \text{ fb}^{-1}$

Projections are done for $Y(\Delta\phi)$ [using Poisson projection]

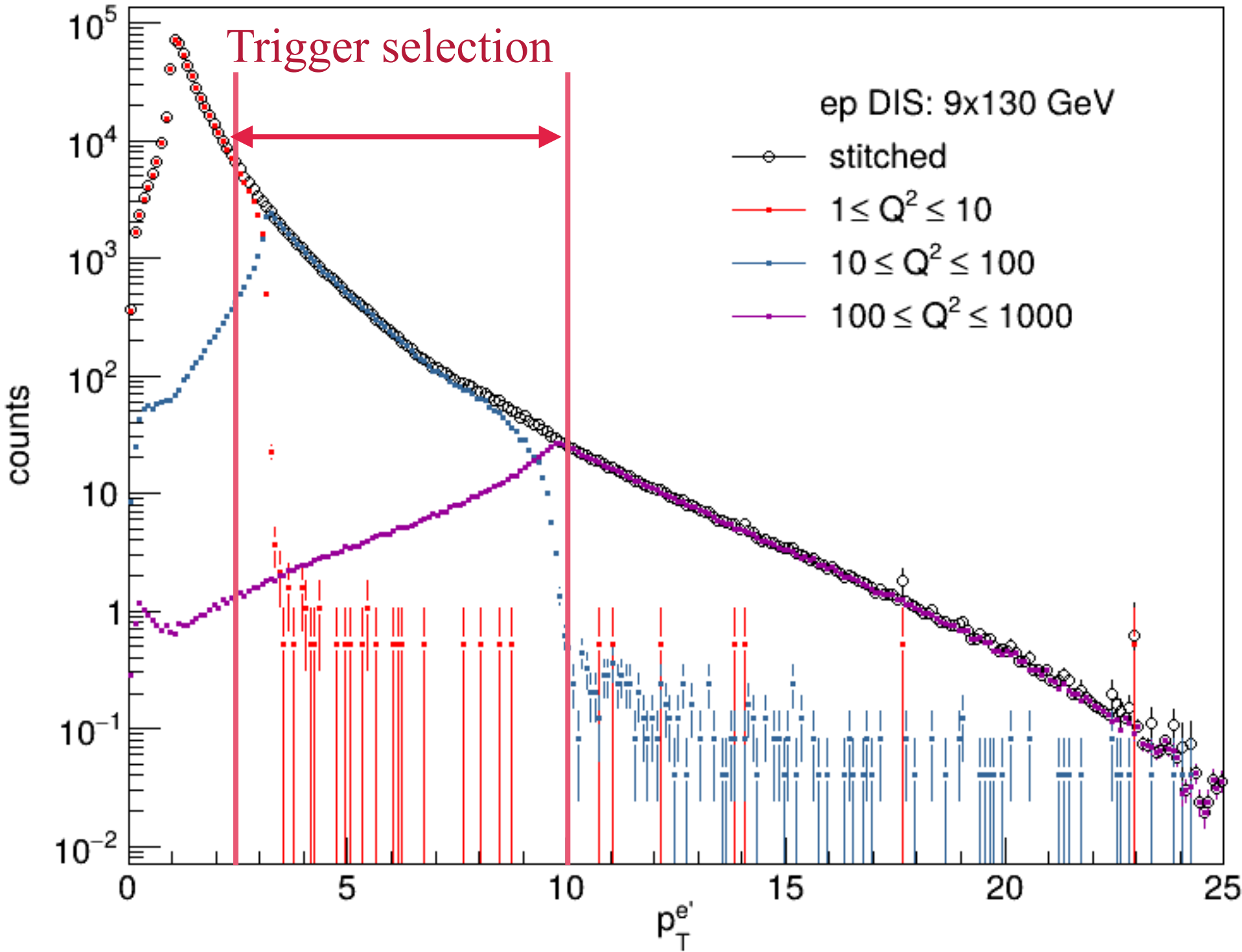
ePIC ESR [arXiv:2608.05377](https://arxiv.org/abs/2608.05377)

Species	Beam energy (GeV)	Integrated luminosity (fb ⁻¹)	Electron-beam polarization	Hadron-beam polarization
e+Ag	9 × 115	1.0	NO	N/A
e+D	9 × 130	1.5	LONG	NO
e + p	9 × 130	1.0	LONG	TRANS and/or LONG
e + p	9 × 275	2.5	LONG	TRANS and/or LONG
e+Au	9 × 100	1.0	LONG	N/A
e + ³ He	9 × 166	1.5	LONG	TRANS and/or LONG

Table 2: Proposed beam configurations and corresponding luminosities for the EIC early running. The $e + A$ energy and luminosity are per nucleon.

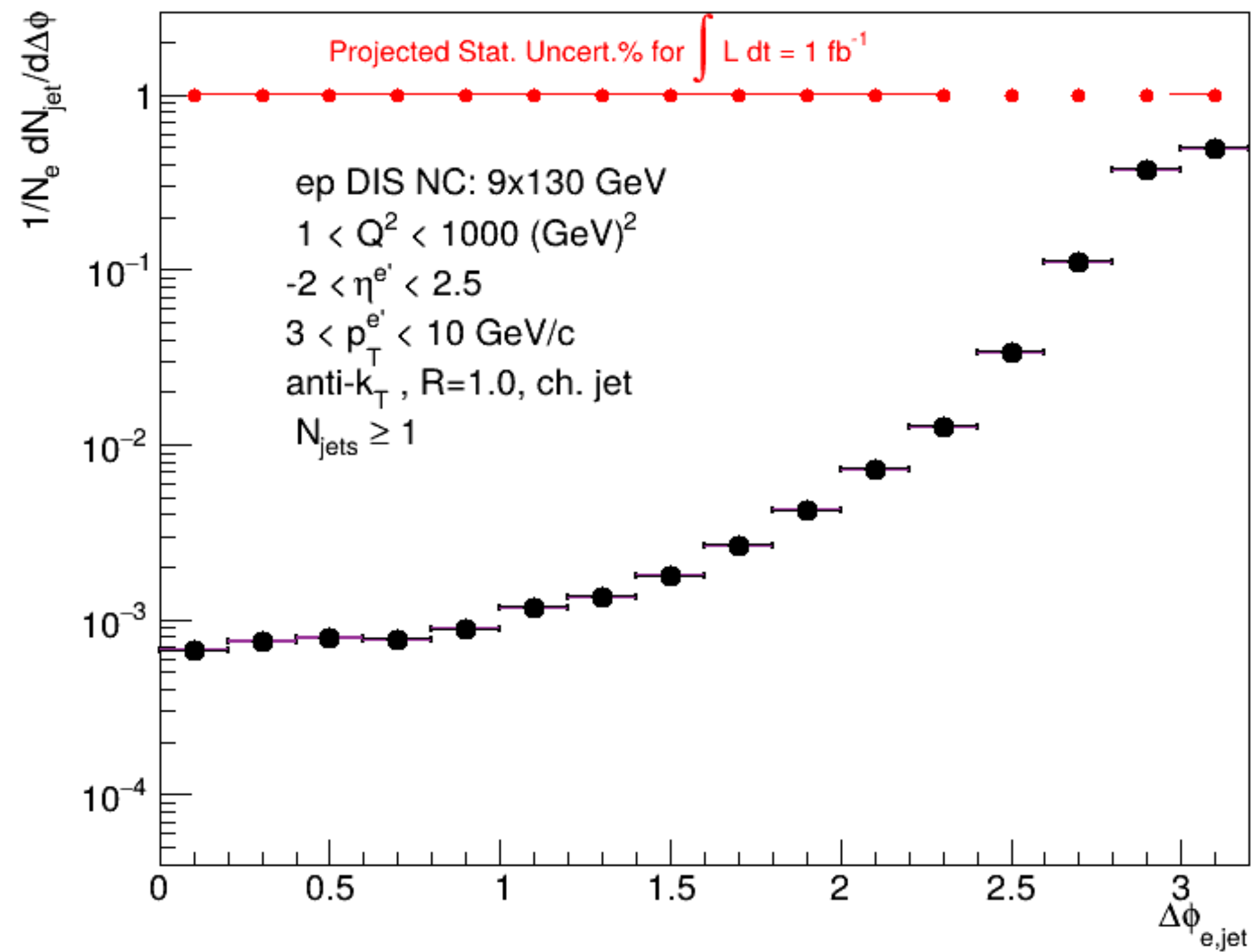
Q^2 [GeV] ²	N_{gen}	σ [pb ⁻¹]
1-10	999643	529217.51
10-100	999987	40650.21
100-1000	1000000	1482.58

Stitched $p_T^{e'}$ distribution

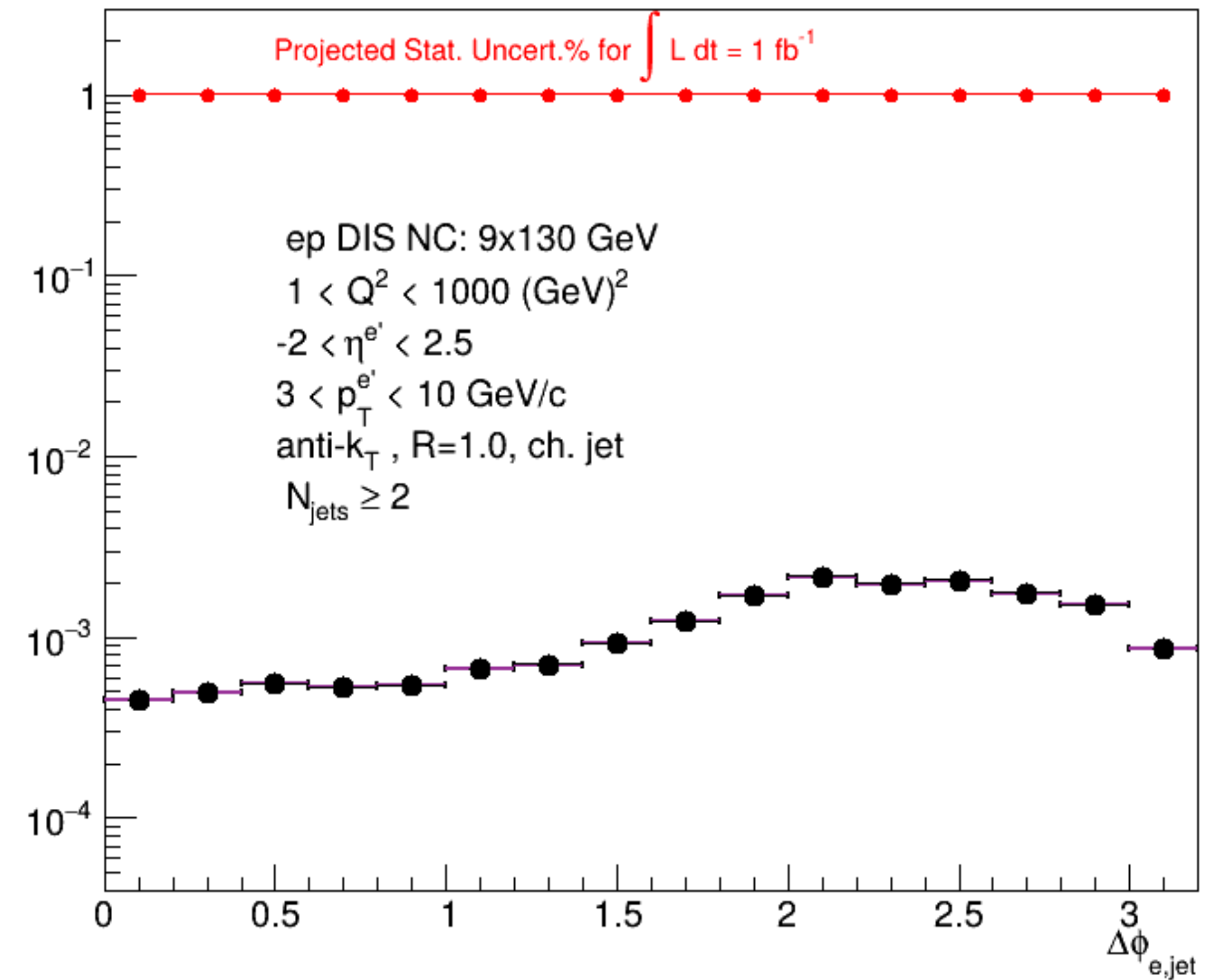


Stitching all Q^2 bins for e+p events

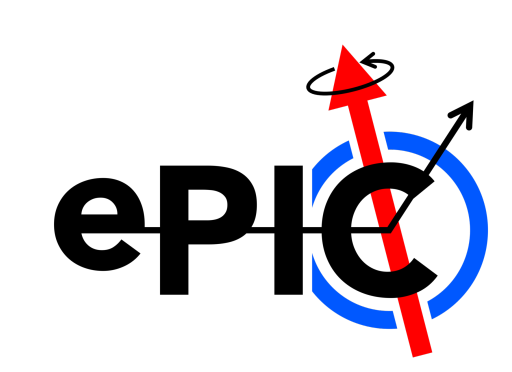
For $N_{\text{jets}} \geq 1$ and $N_{\text{jets}} \geq 2$



Expected maximum statistical % uncertainty is $\sim 1.4\%$

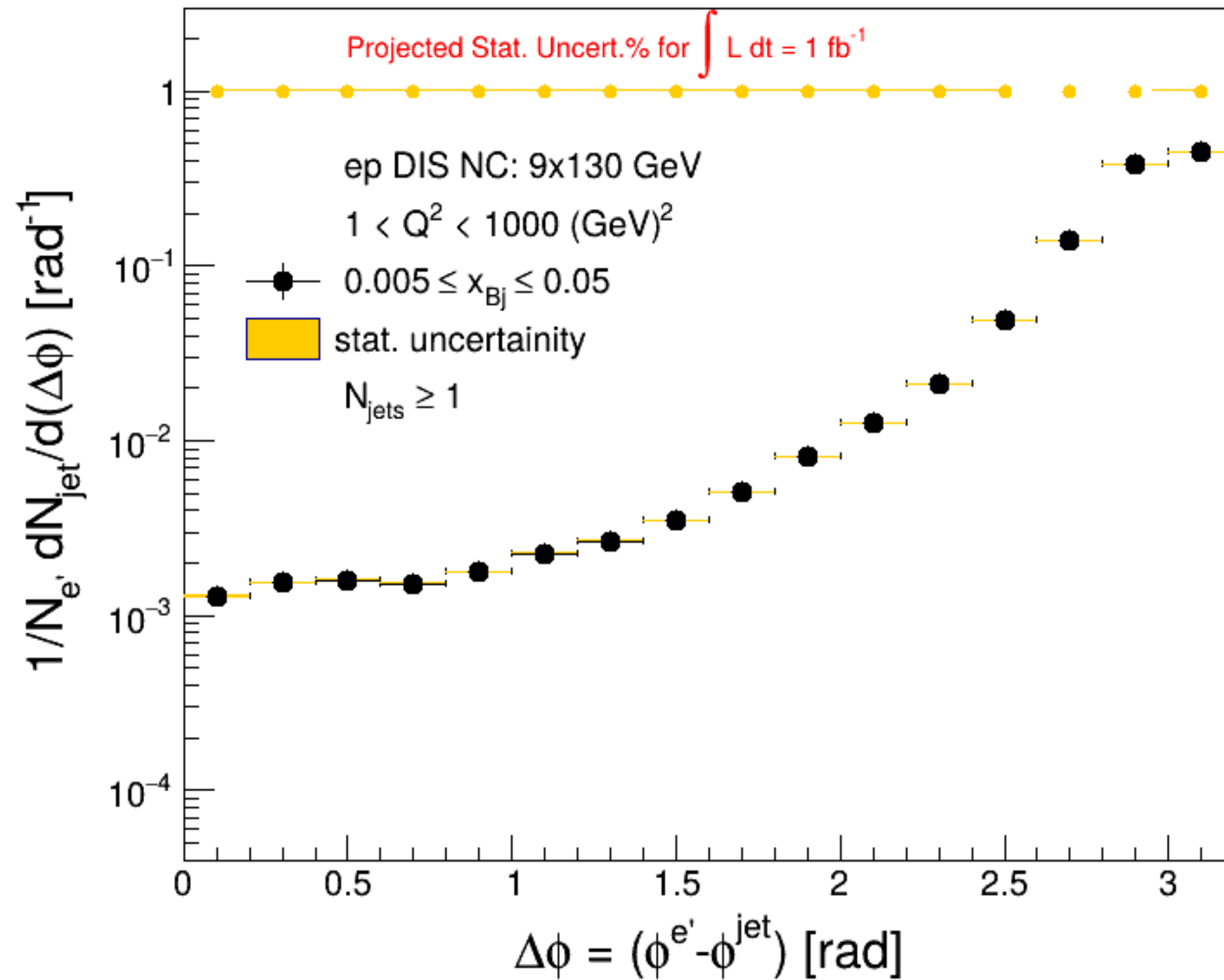


Expected maximum statistical % uncertainty is $\sim 1.7\%$

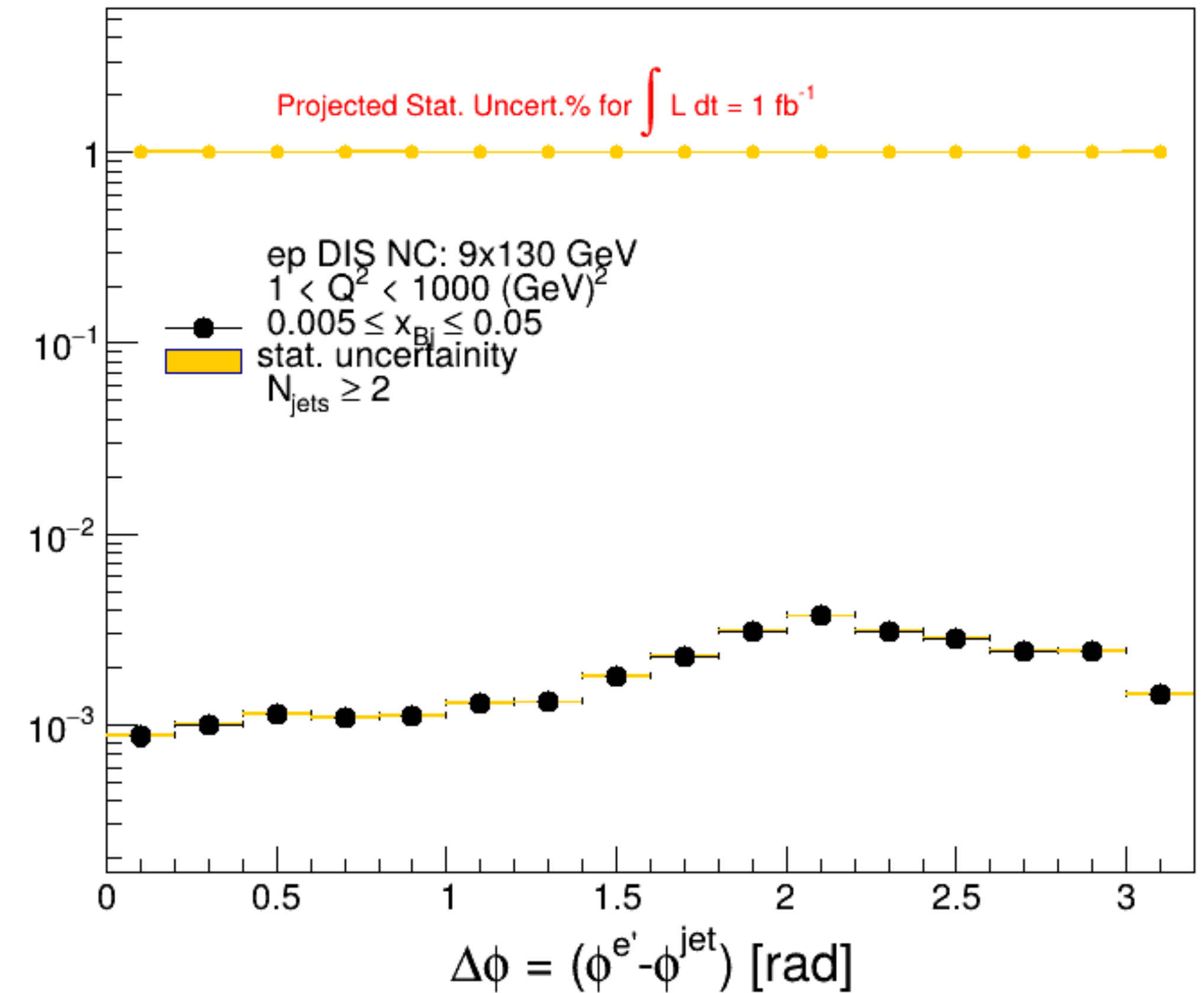


e+jet correlations in e+p events for different x_{Bj}

For $N_{\text{jets}} \geq 1$ and $N_{\text{jets}} \geq 2$ for $0.005 < x_{\text{Bj}} < 0.05$



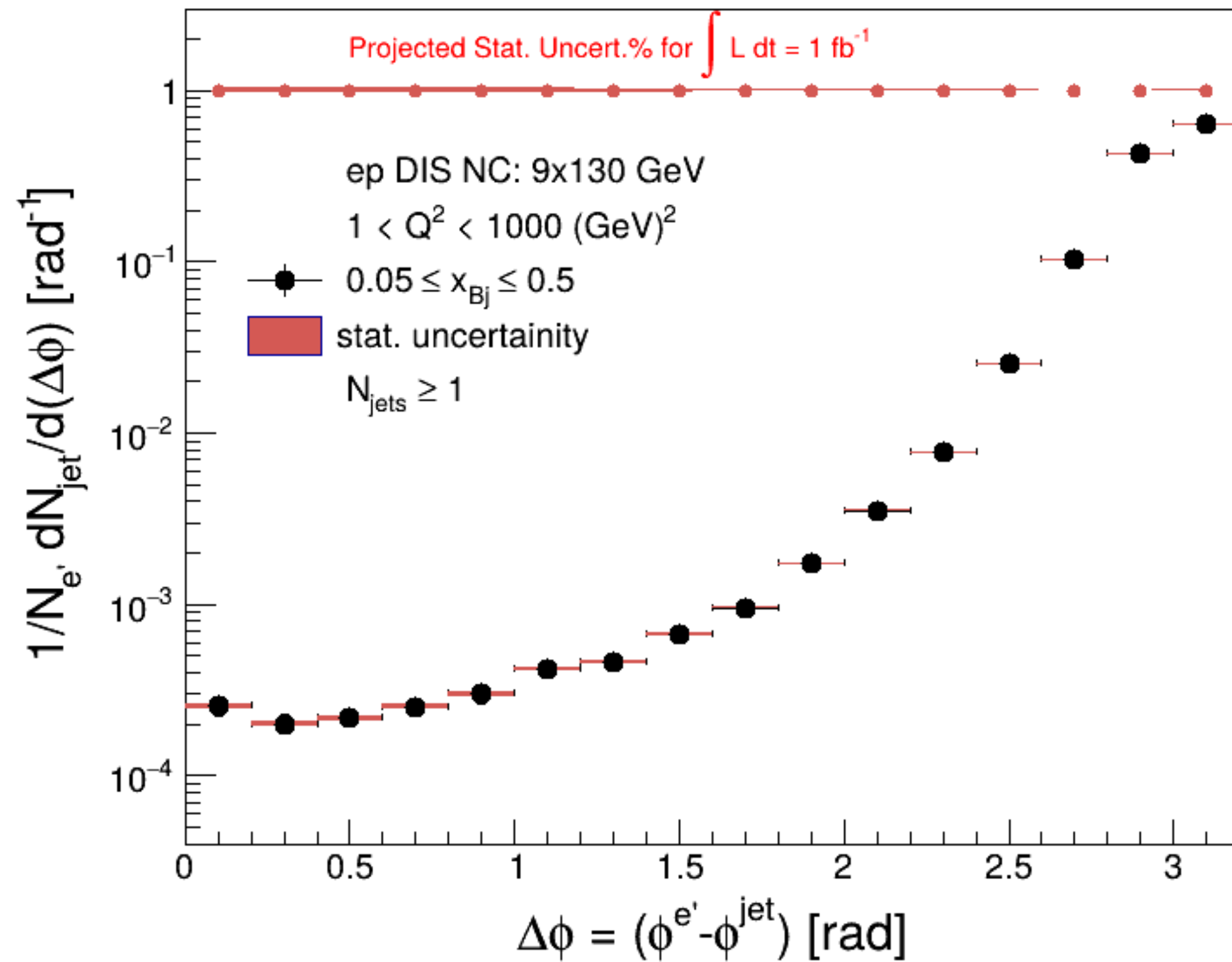
Expected maximum statistical % uncertainty is $\sim 1.5\%$



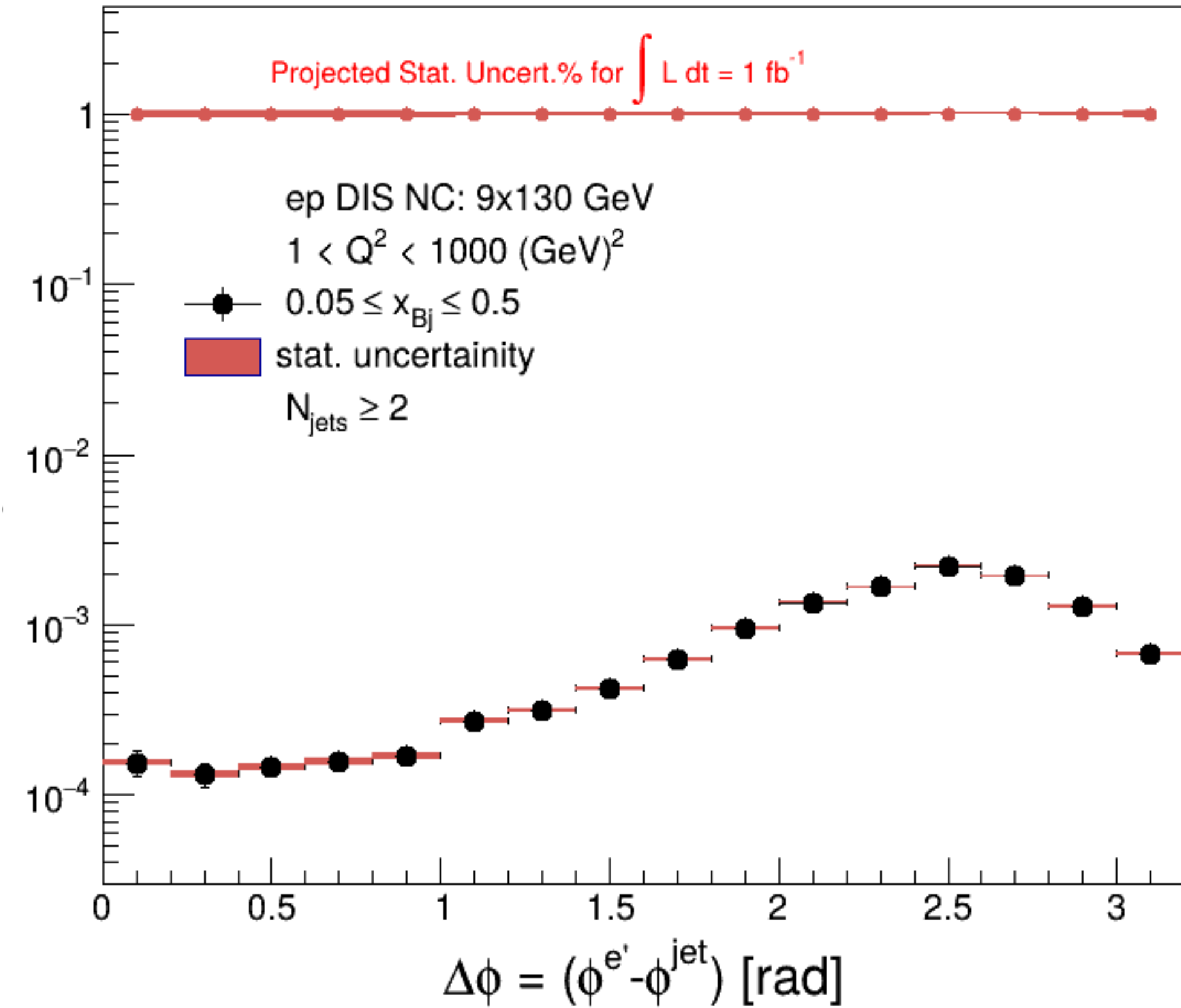
Expected maximum statistical % uncertainty is $\sim 1.9\%$

E+jet correlations in e+p events at different $0.05 < x_{Bj} < 0.5$

For $N_{jets} \geq 1$ and $N_{jets} \geq 2$

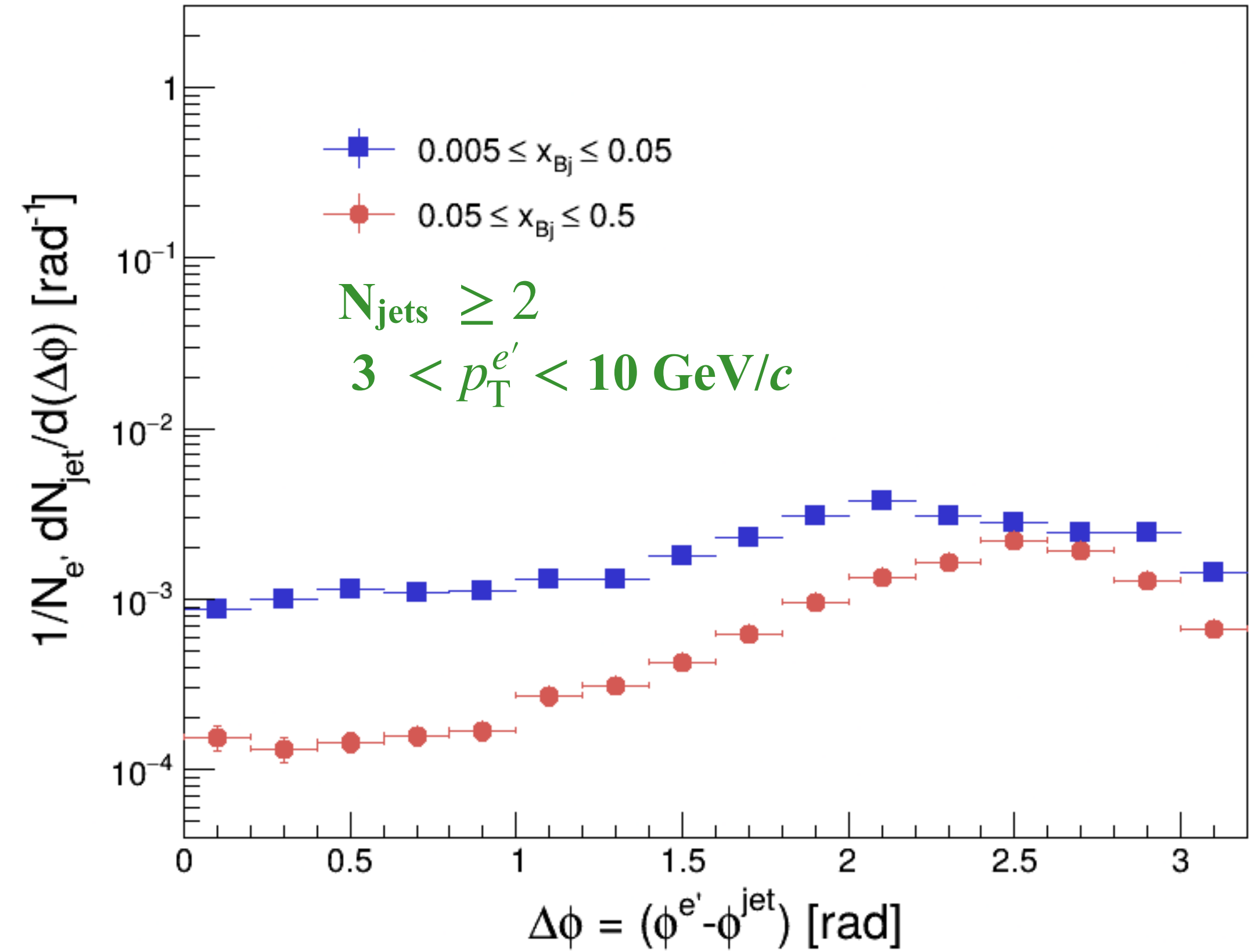
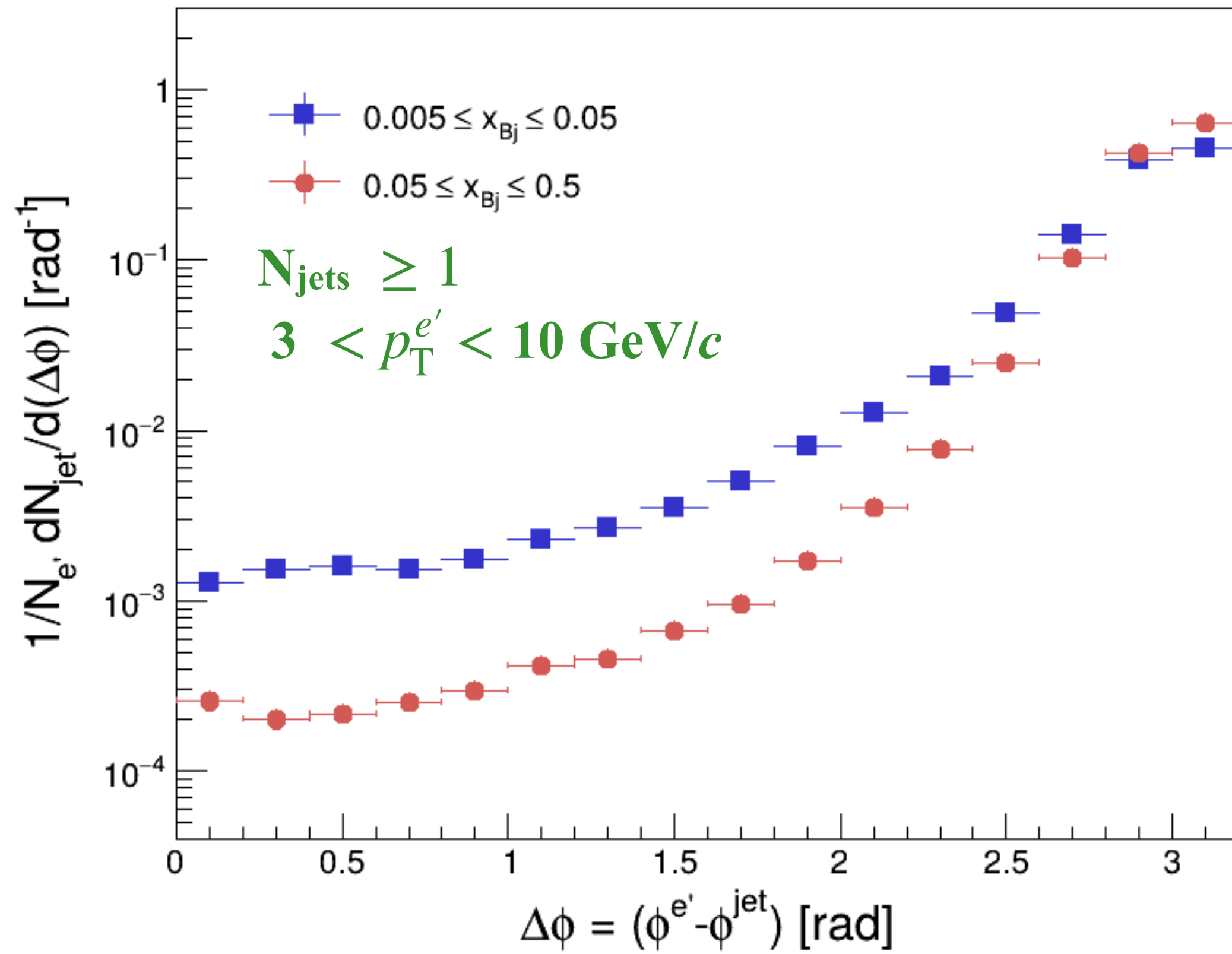


Expected maximum statistical % uncertainty is $\sim 3.8\%$

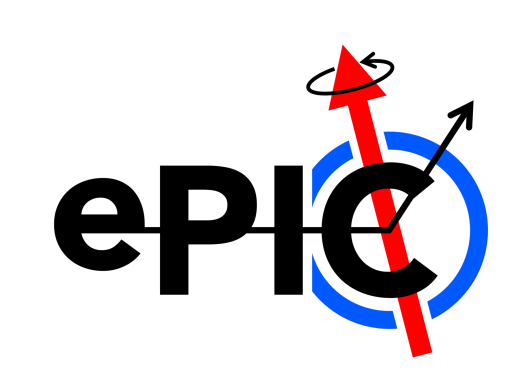


Expected maximum statistical % uncertainty is $\sim 4.7\%$

e+jet correlations in e+p events at different x_{Bj} comparison



- Shows x_{Bj} dependence of $\Delta\phi$ correlations
- At $0.005 < x_{Bj} < 0.05$, $\Delta\phi$ correlations relatively wider than $0.05 < x_{Bj} < 0.5$



July campaign eAu @ 9x100 GeV DIS analysis

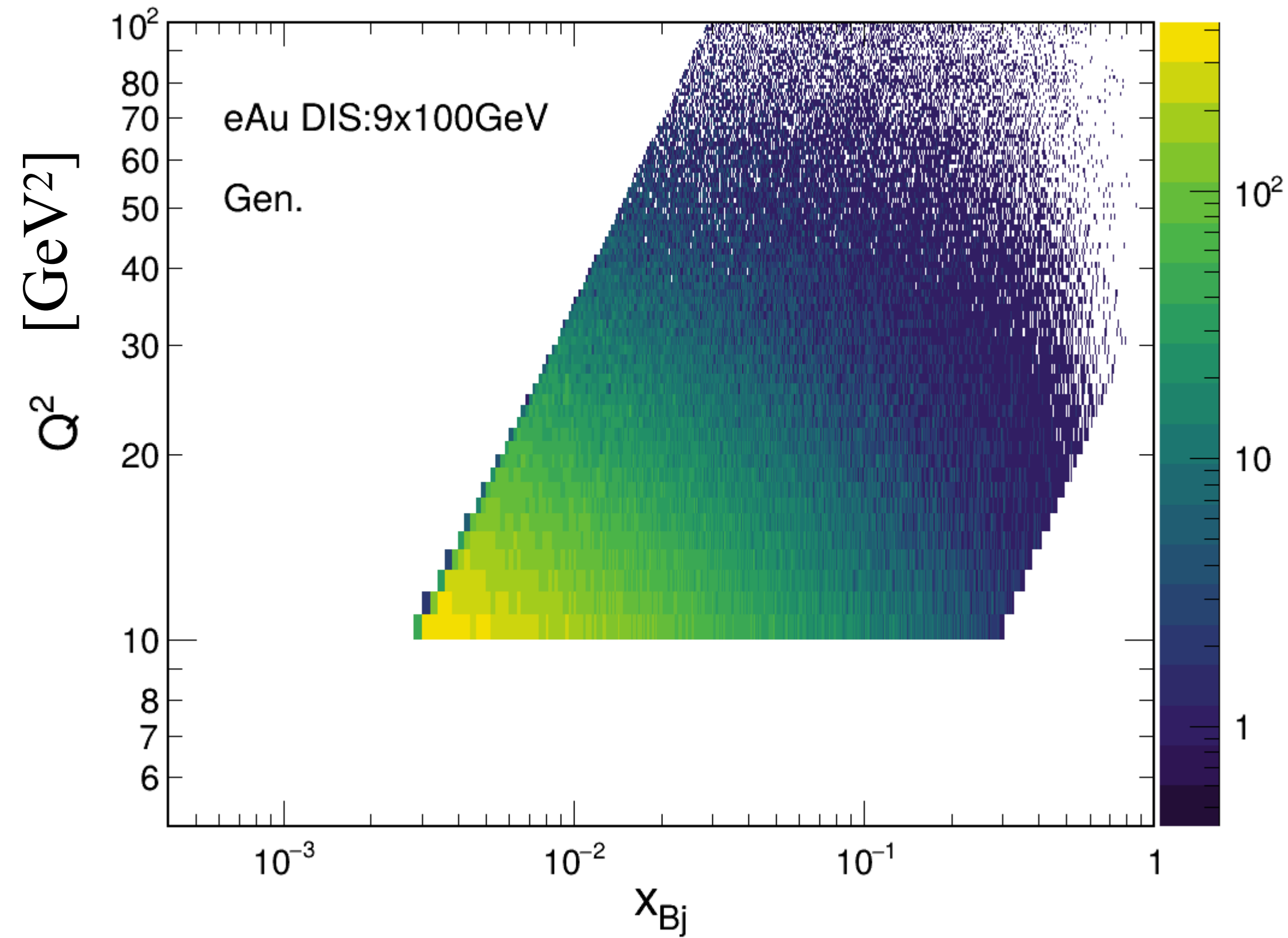
```
epic:/REC0/26.07.1/epic_craterlake/DIS/BeAGLE1.03.02-3.1/eAu/9x100/q2_1to10  
epic:/REC0/26.07.1/epic_craterlake/DIS/BeAGLE1.03.02-3.1/eAu/9x100/q2_10to100  
epic:/REC0/26.07.1/epic_craterlake/DIS/BeAGLE1.03.02-3.1/eAu/9x100/q2_100to10000
```

Issue reported: No reco level Q^2 , x , y , and scattered electron information available
So we used Gen Level information for this presentation

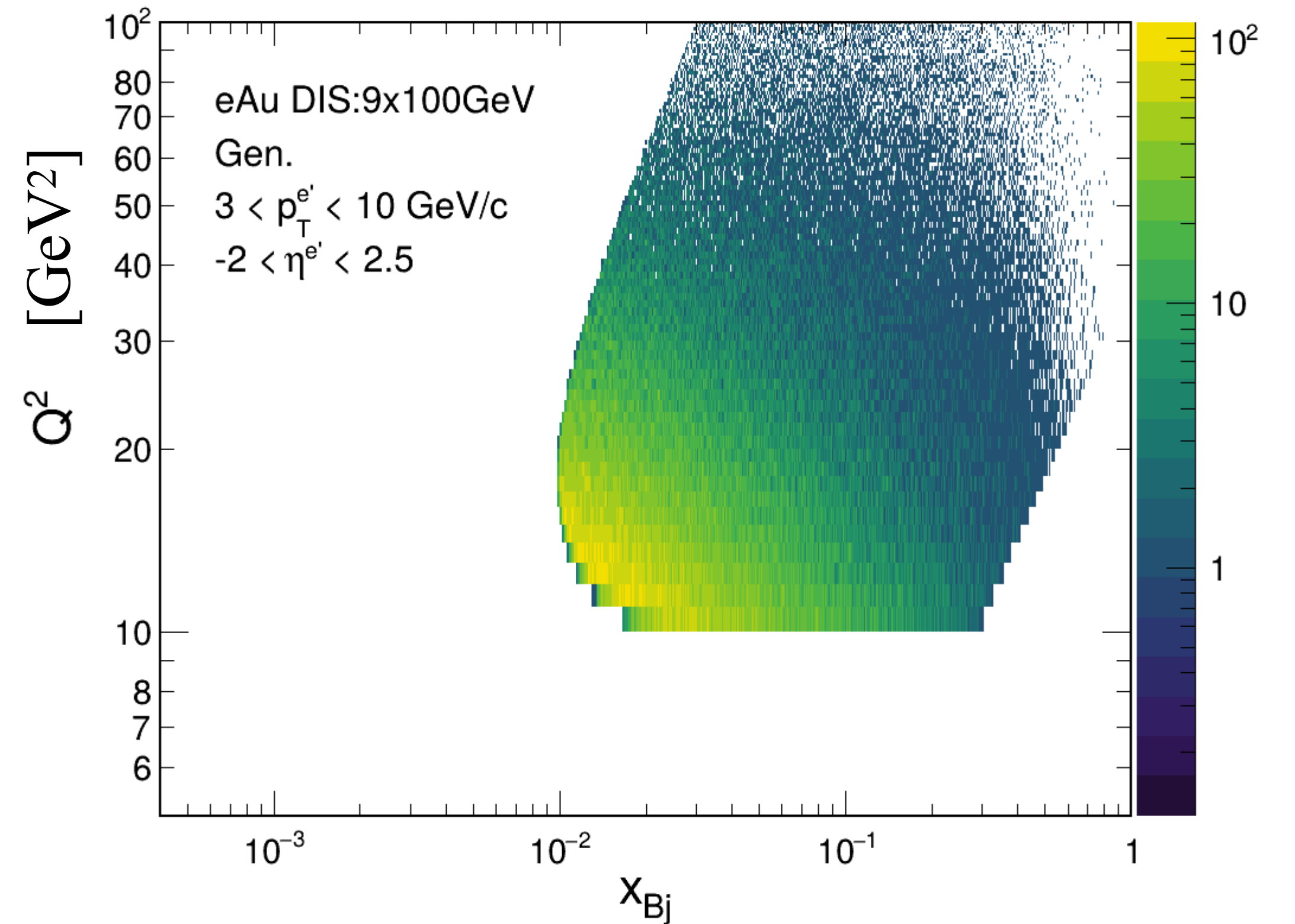
No **EVGEN** files found for eAu rootfiles in 26.07.1 campaign. Need it for obtain Cross-Section information.

Q^2 vs x_{Bj}

Without trigger Gen. level



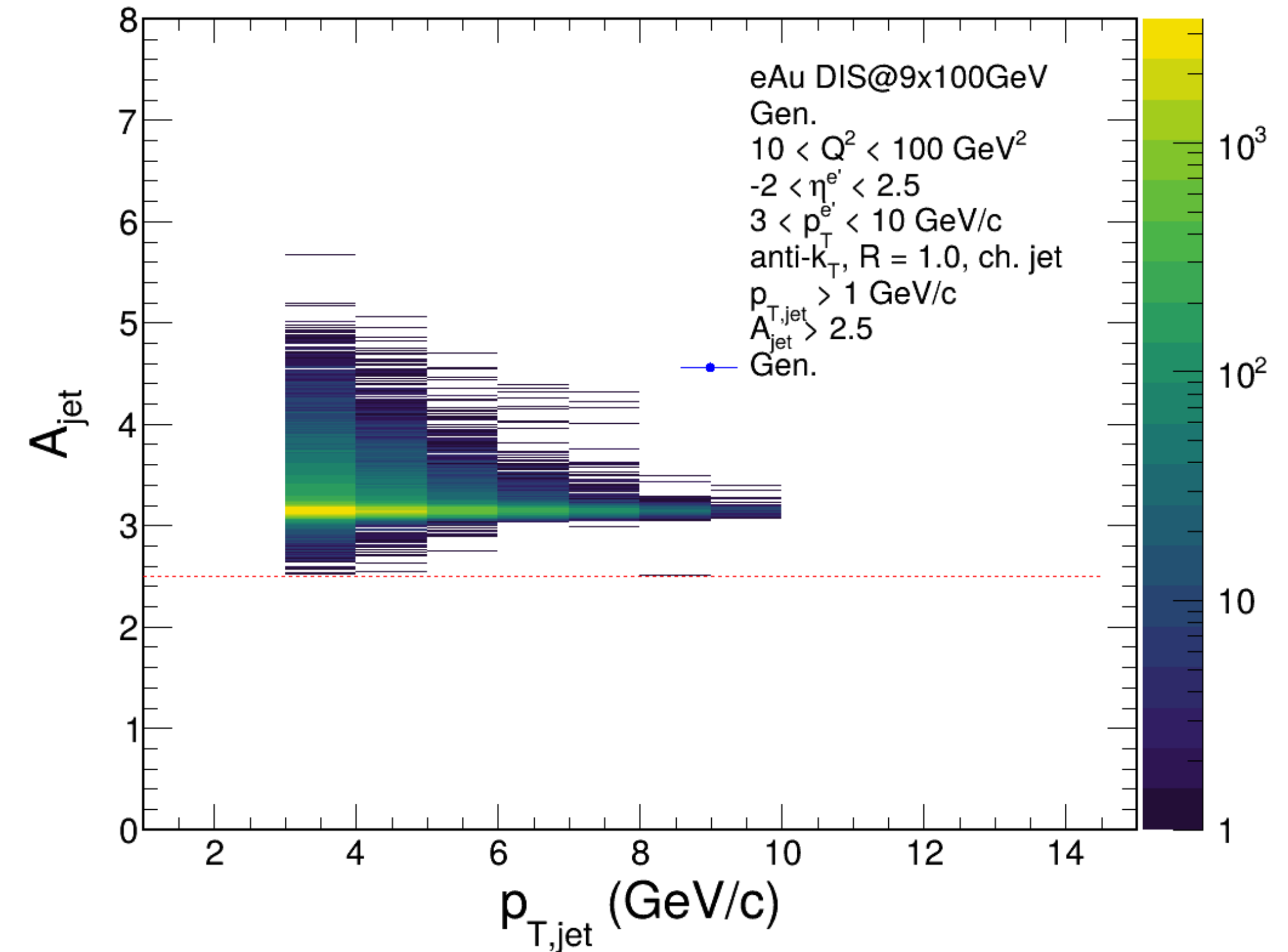
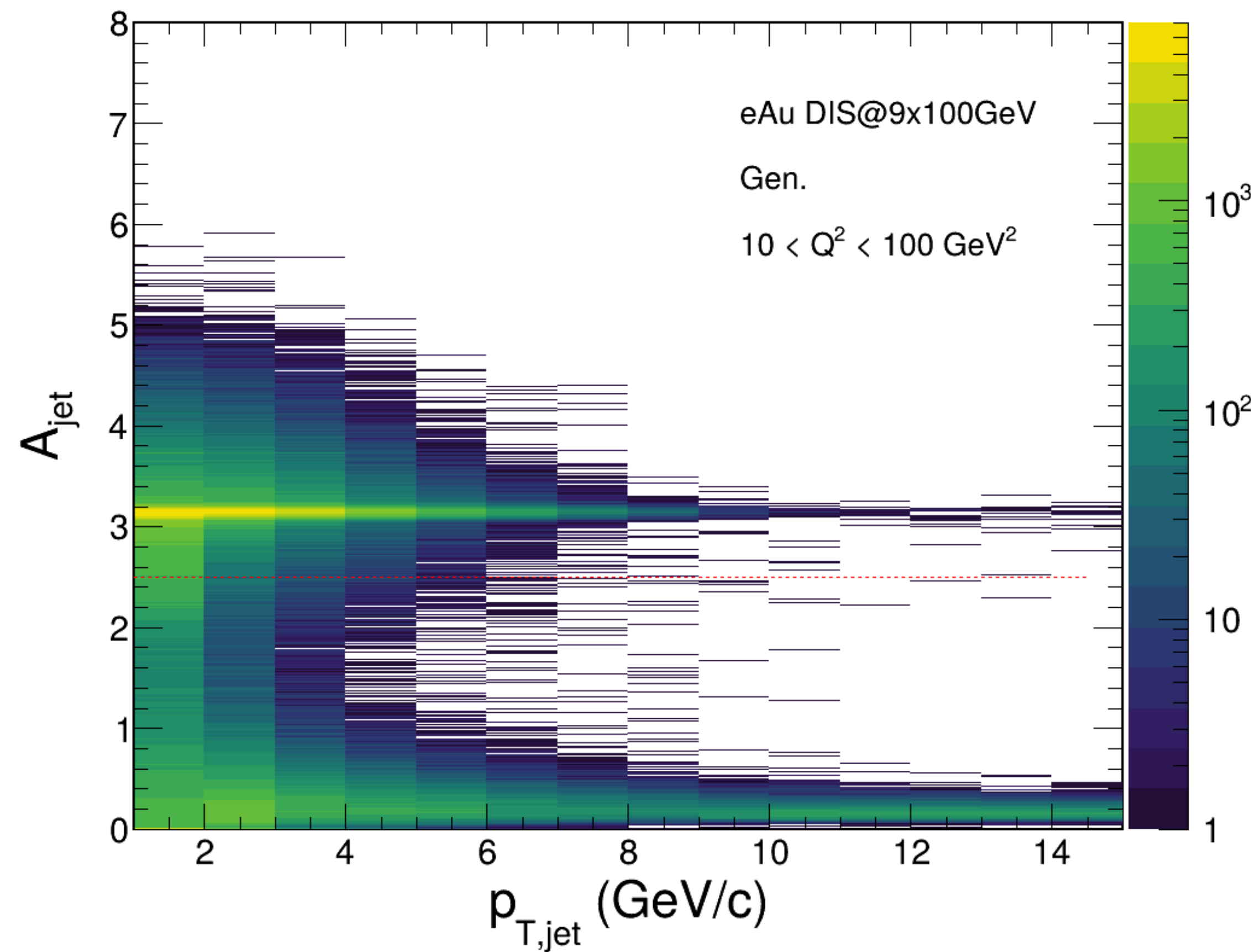
With trigger Gen. level



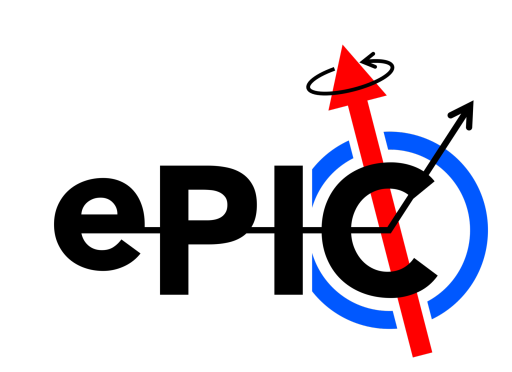
Note: no reco. level information in this campaign (need to reconstruct)

Jet area vs. jet p_T

Gen. level

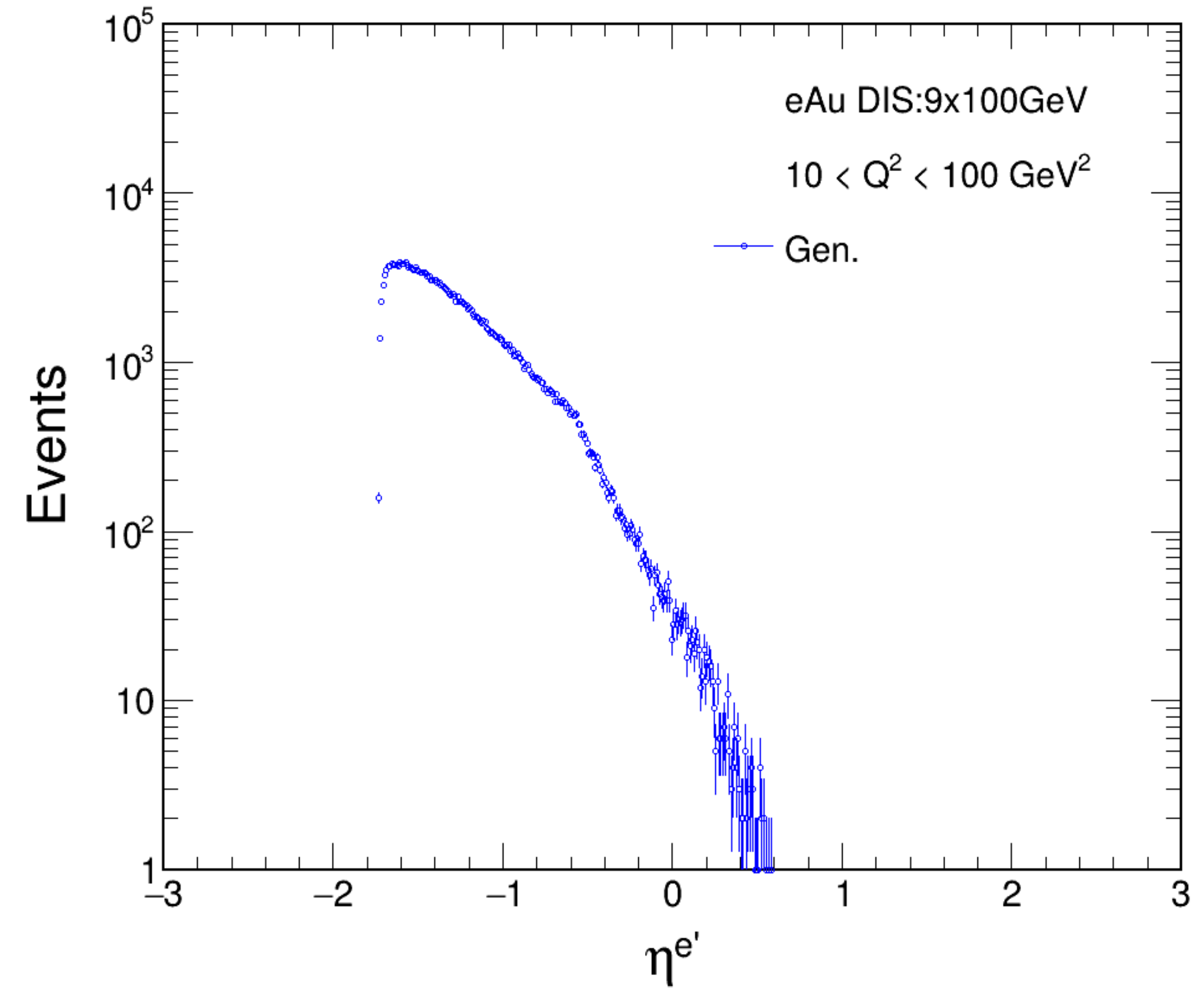
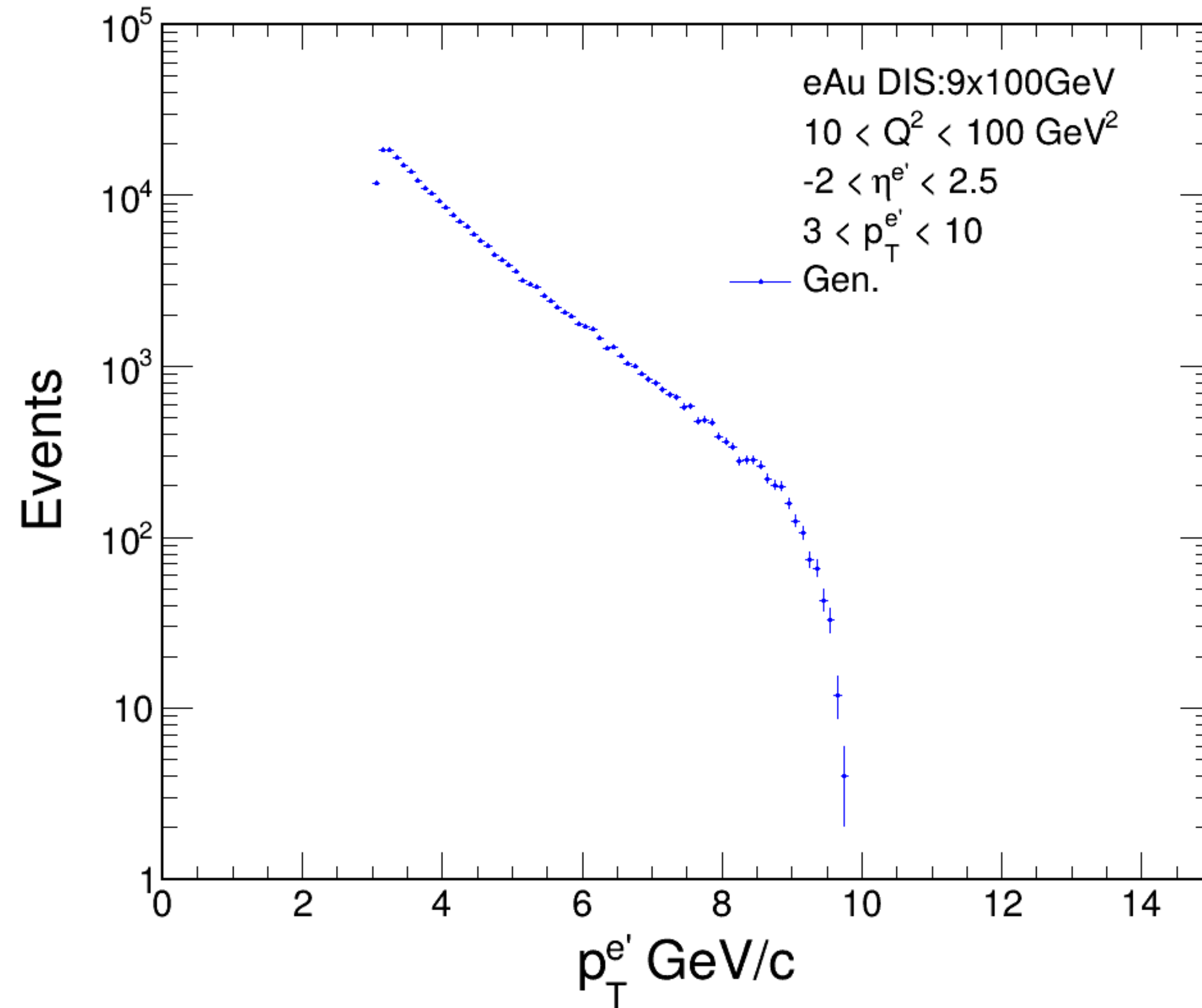


After applying scattered electron and jet p_T and η acceptance cuts



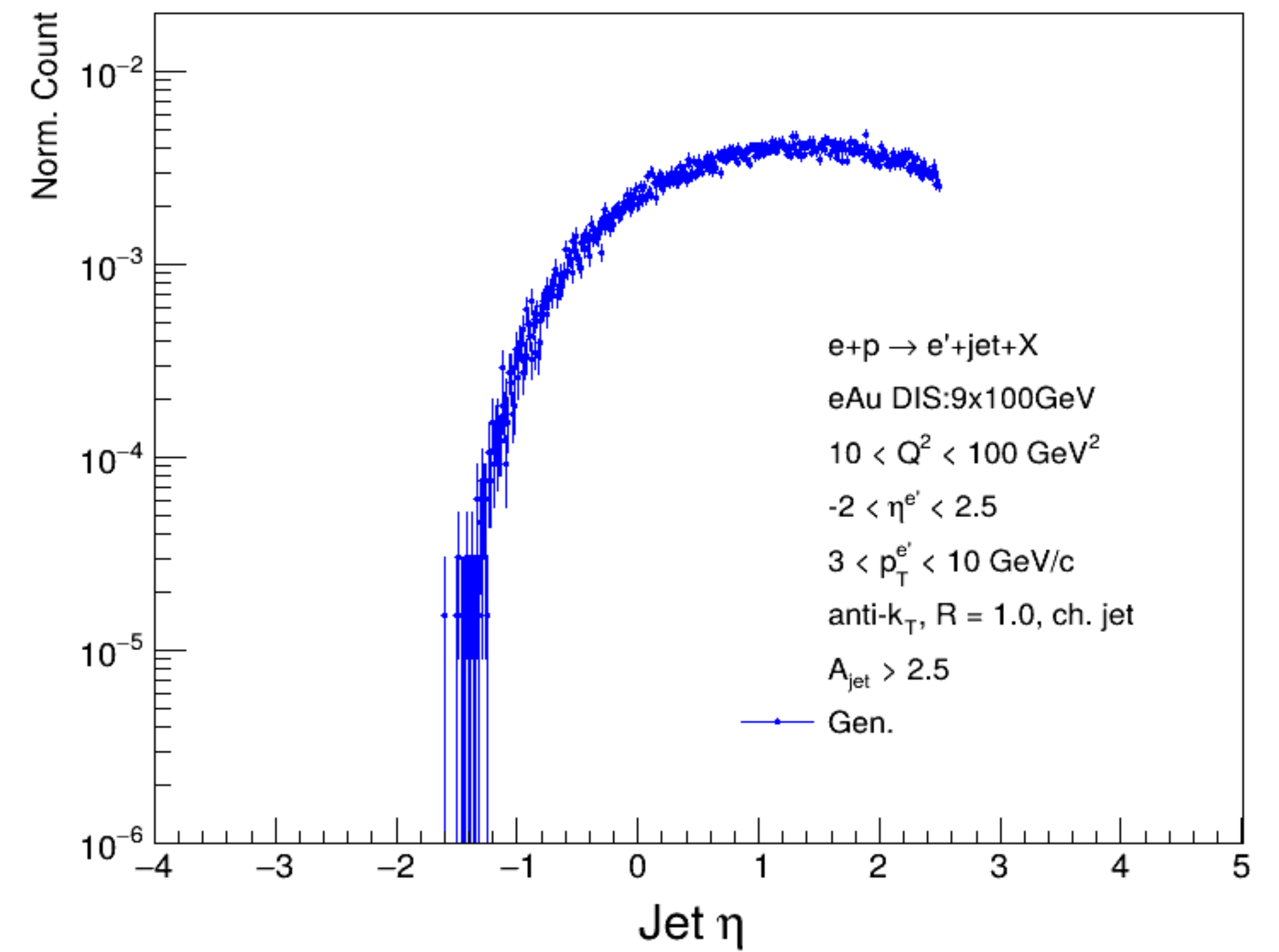
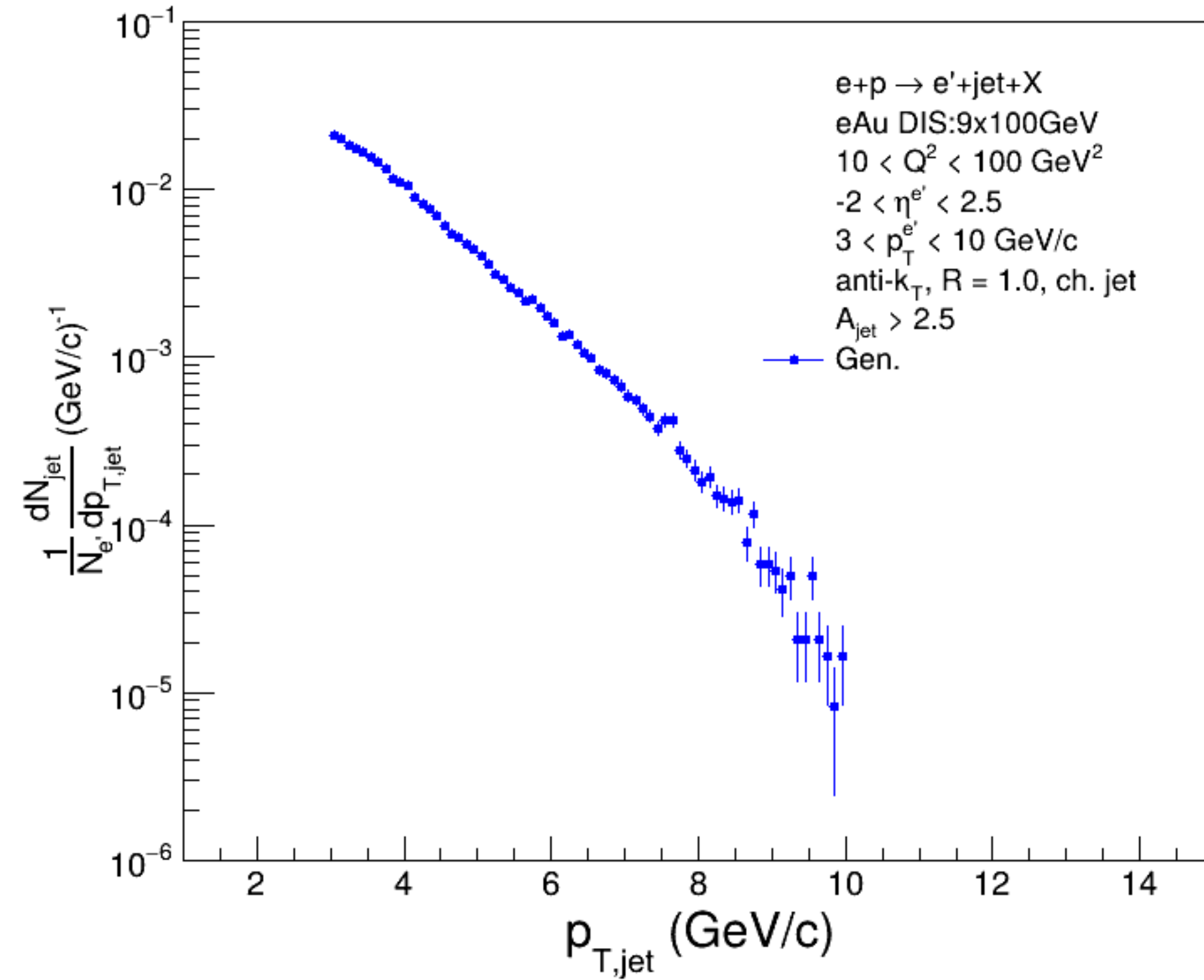
Scattered electron kinematic variables

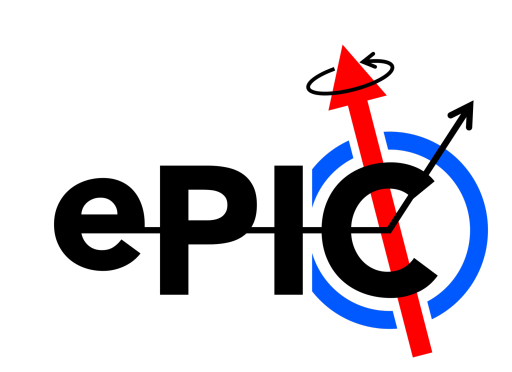
Gen. level ($10 < Q^2 < 100 \text{ GeV}^2$)



Scattered electron trigger recoil ch. jets

Gen. level ($10 < Q^2 < 100 \text{ GeV}^2$)

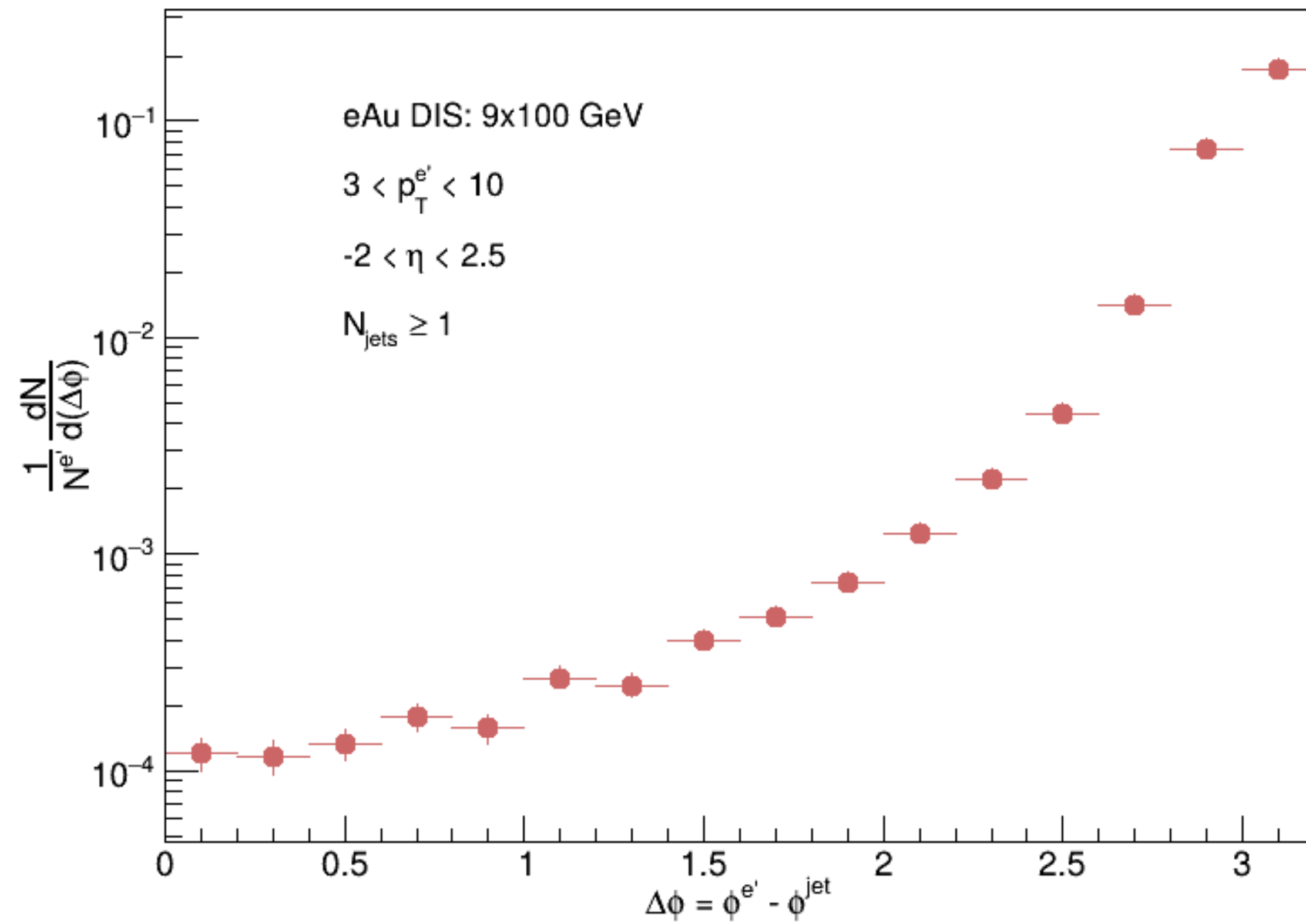




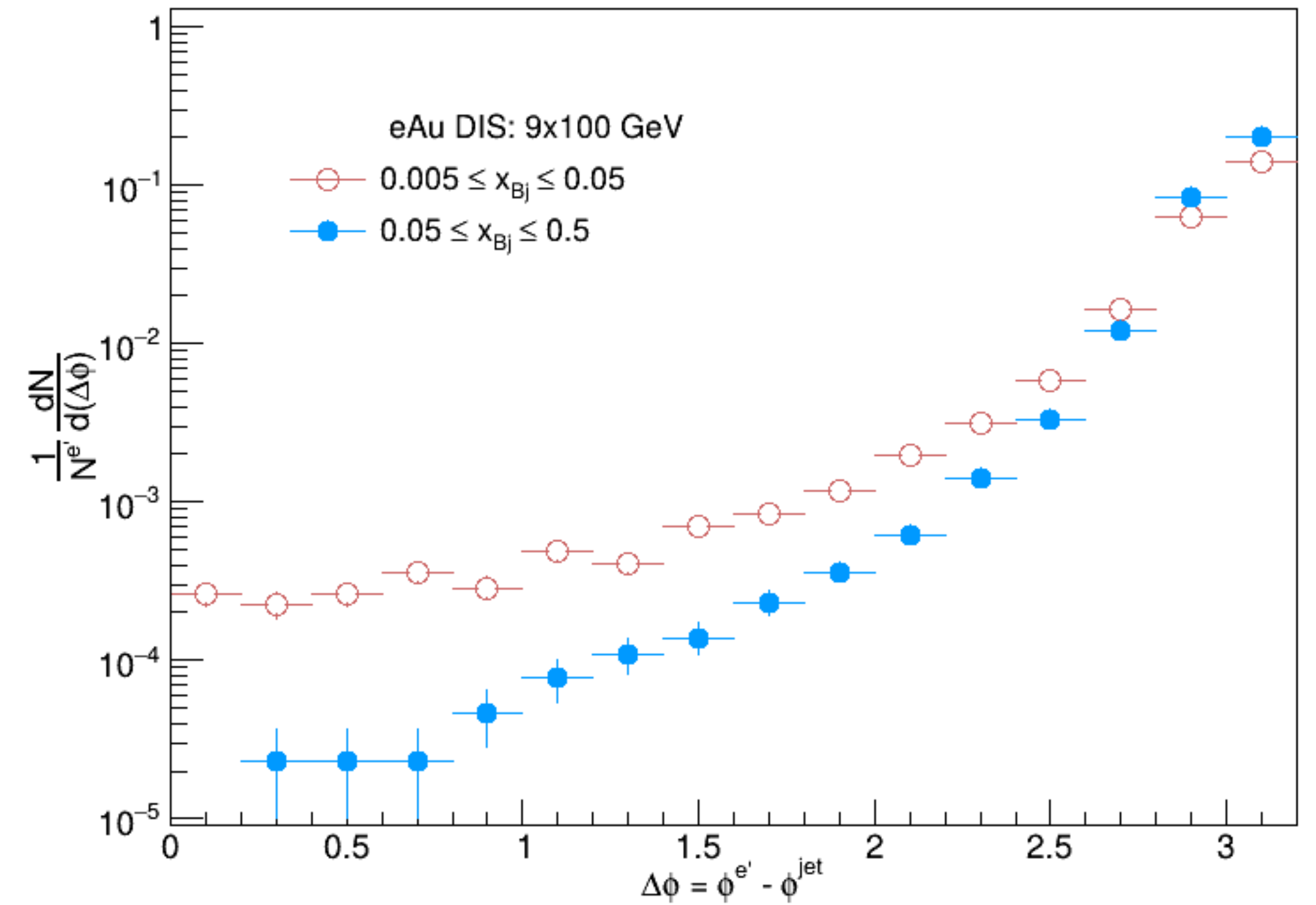
e+jet correlations in eAu events

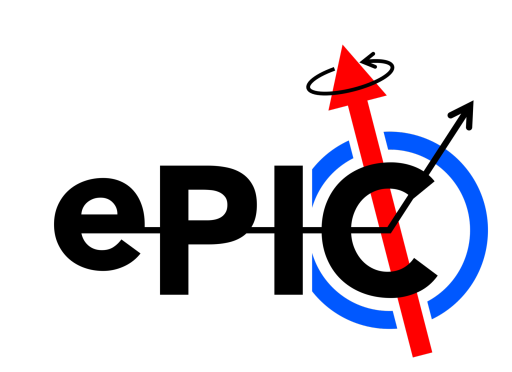
Gen. level ($10 < Q^2 < 100 \text{ GeV}^2$)

e+jet correlation in eAu



e+jet correlation in different x_{Bj}





Summary and outlook

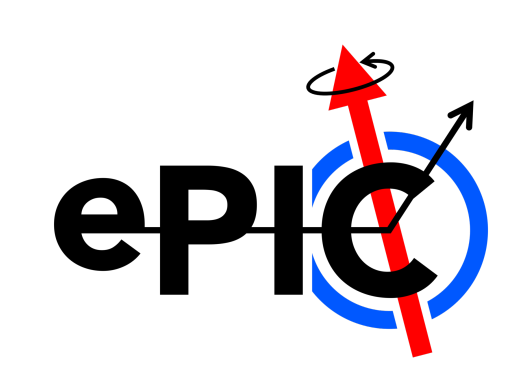
ep @ 9x130 GeV² analysis

- We presented $\Delta\phi(= \phi^{e'} - \phi^{\text{jet}})$ correlations for $1 < Q^2 < 1000 \text{ GeV}^2$ and at two x_{Bj} regions
- Maximum expected statistical uncertainty in ep DIS NC events with int. Lumi. 1fb^{-1} is between 1.4 to 4.7% depending upon N_{jets} and x_{Bj}
- At $0.005 < x_{\text{Bj}} < 0.05$, $\Delta\phi$ correlations shows wider distribution compared with $0.05 < x_{\text{Bj}} < 0.5$
- These results provide baseline for the eAu collisions

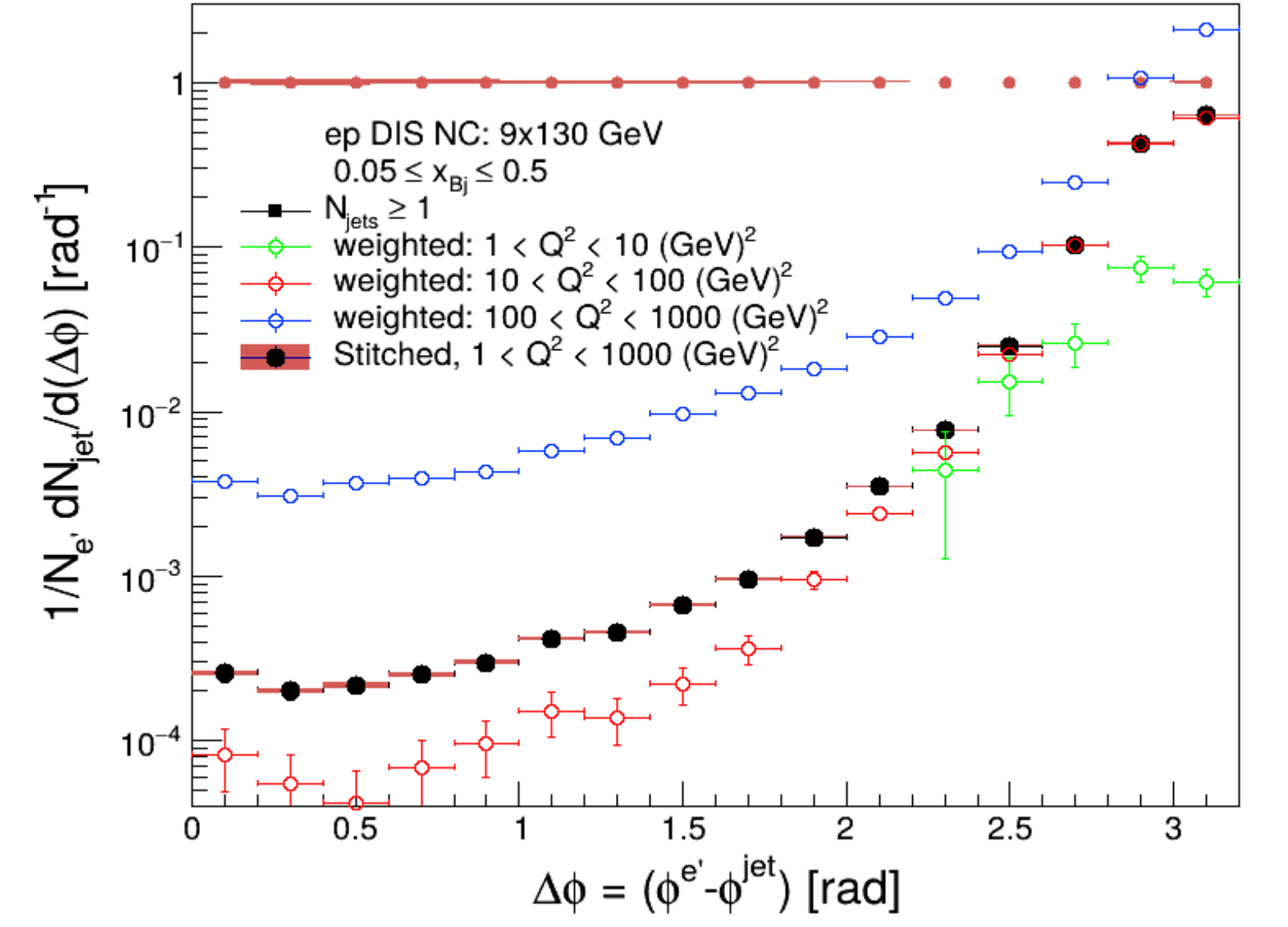
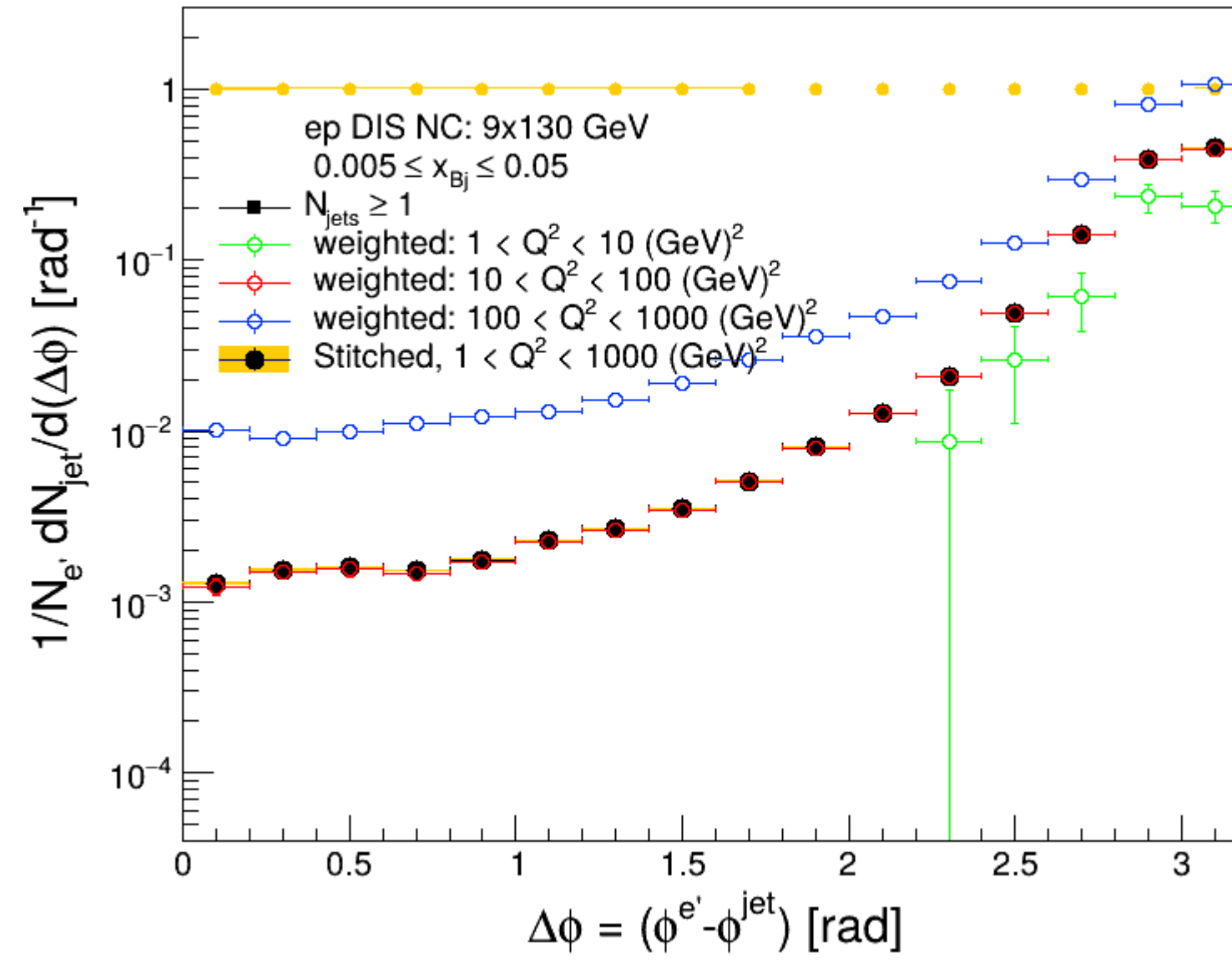
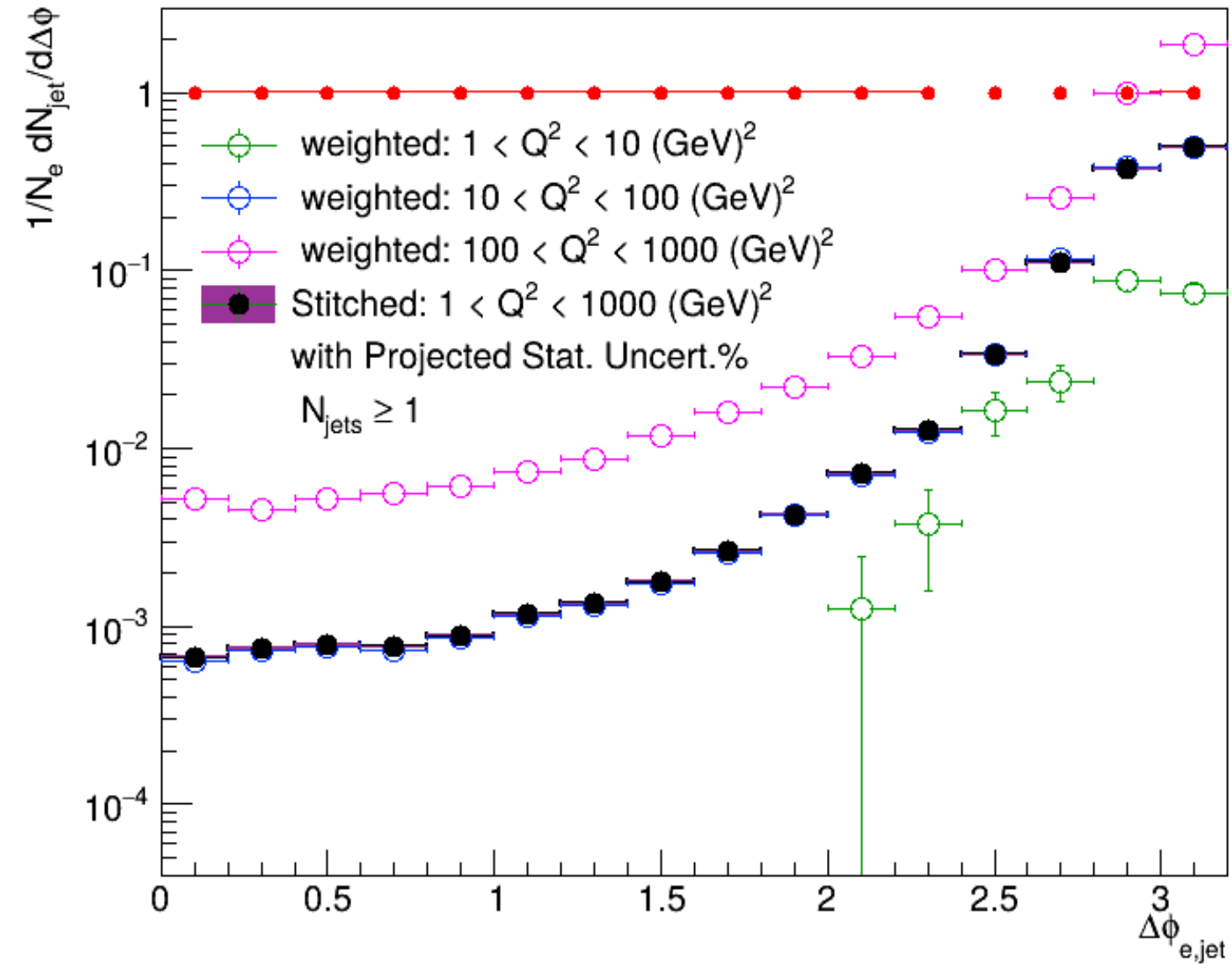
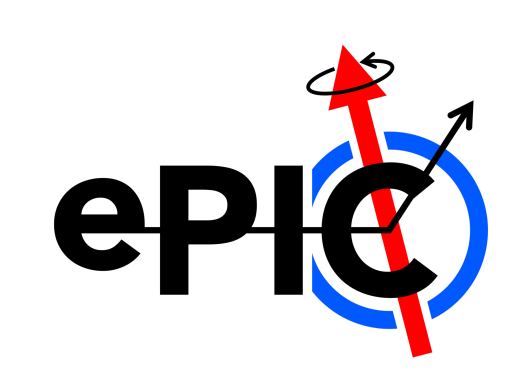
eAu @ 9x100 GeV² analysis

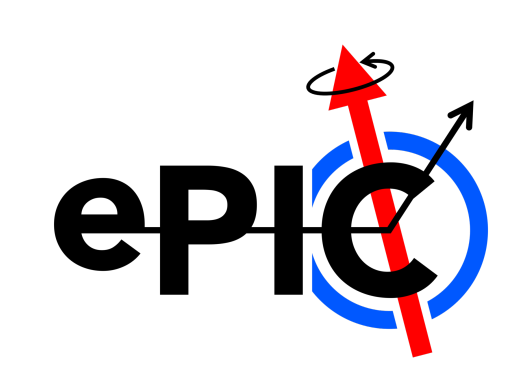
- Analysed eAu, $10 < Q^2 < 100 \text{ GeV}^2$, with Gen. Level information (need to implement reco. Information, ongoing)
- Ongoing: $1 < Q^2 < 1000 \text{ GeV}^2$ and implementing with the ep kinematic range for comparison

No EVGEN files found for eAu rootfiles in 26.07.1 campaign. Required for obtain Cross-Section information.



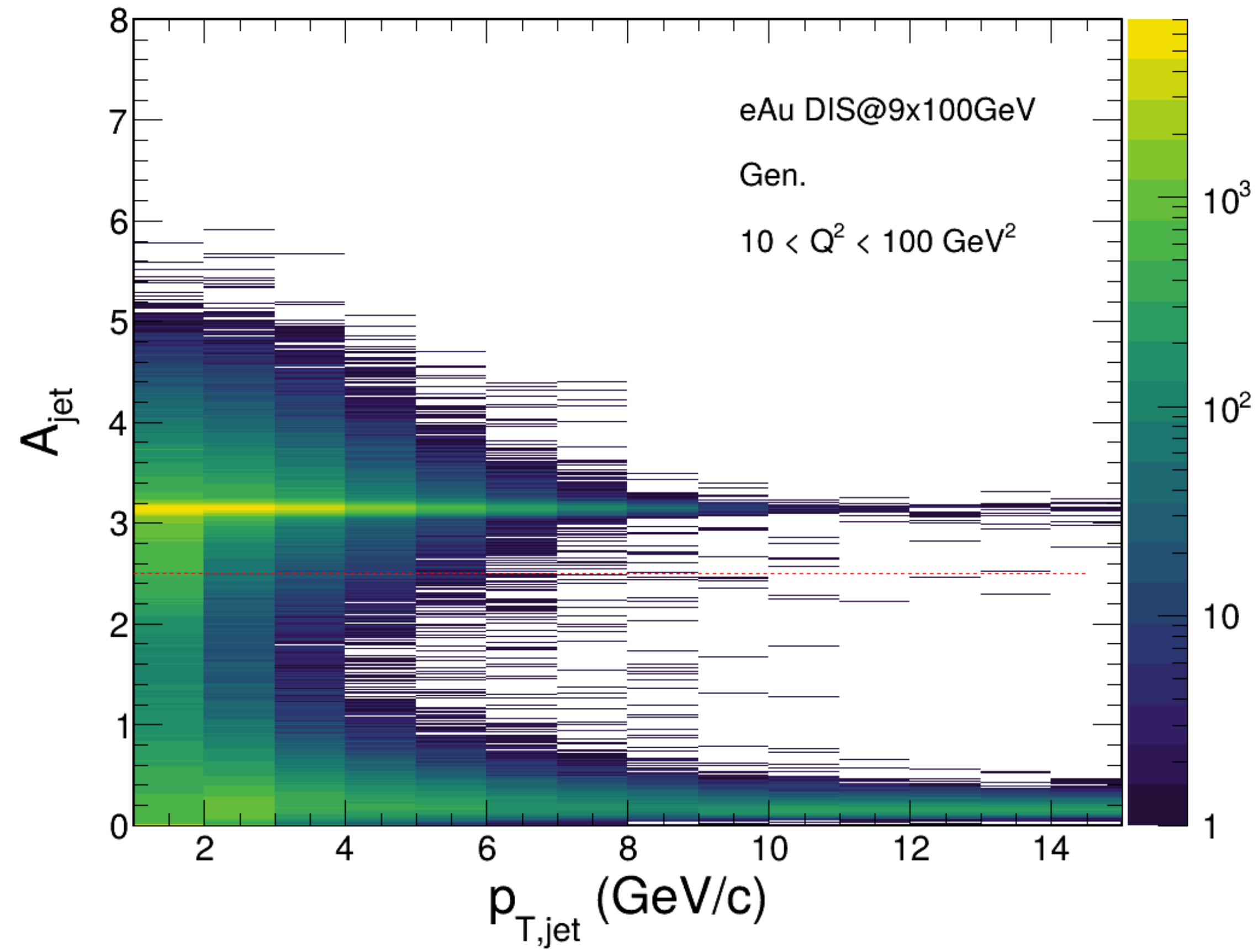
BACKUP





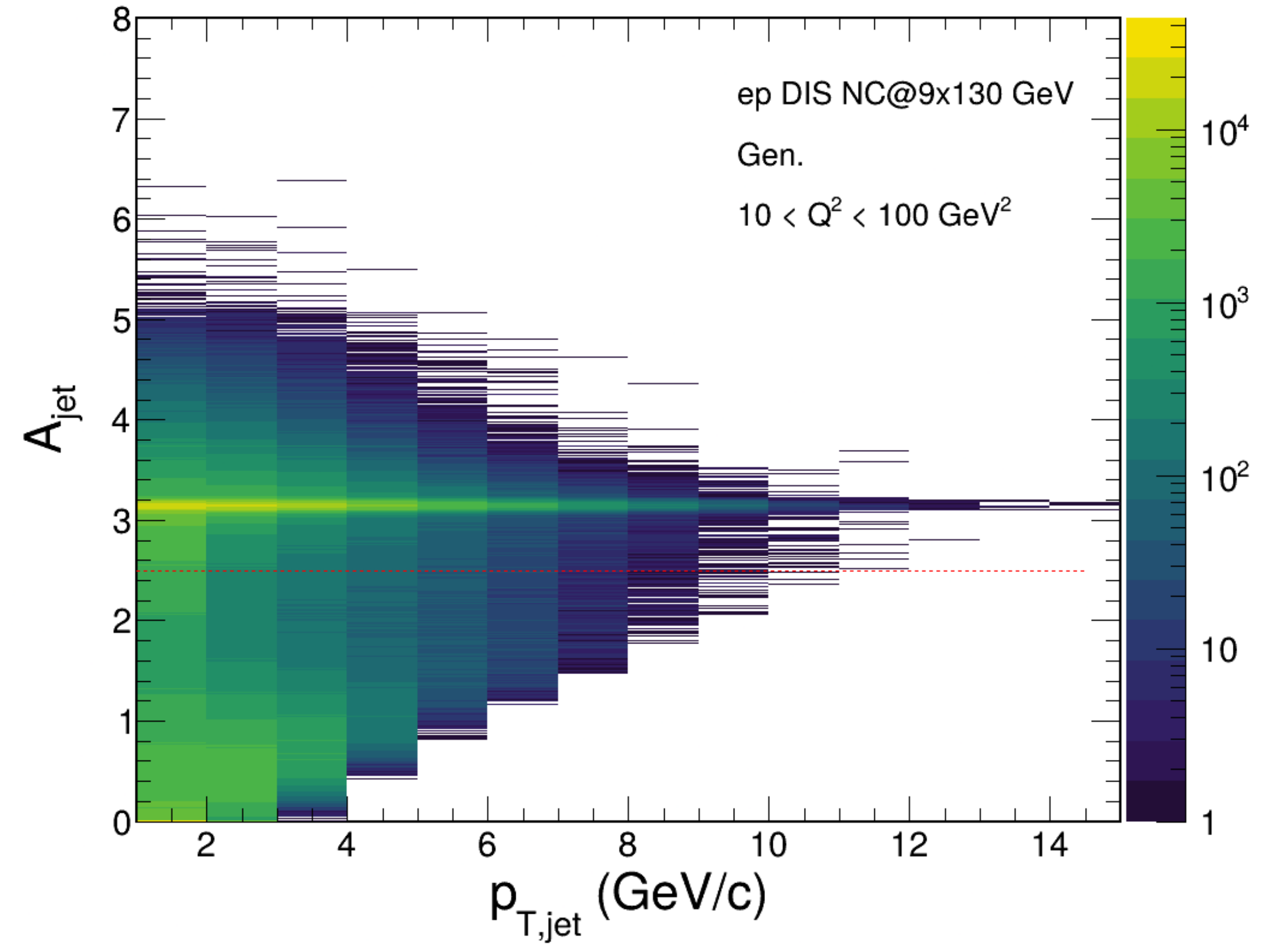
Gen. level

eAu



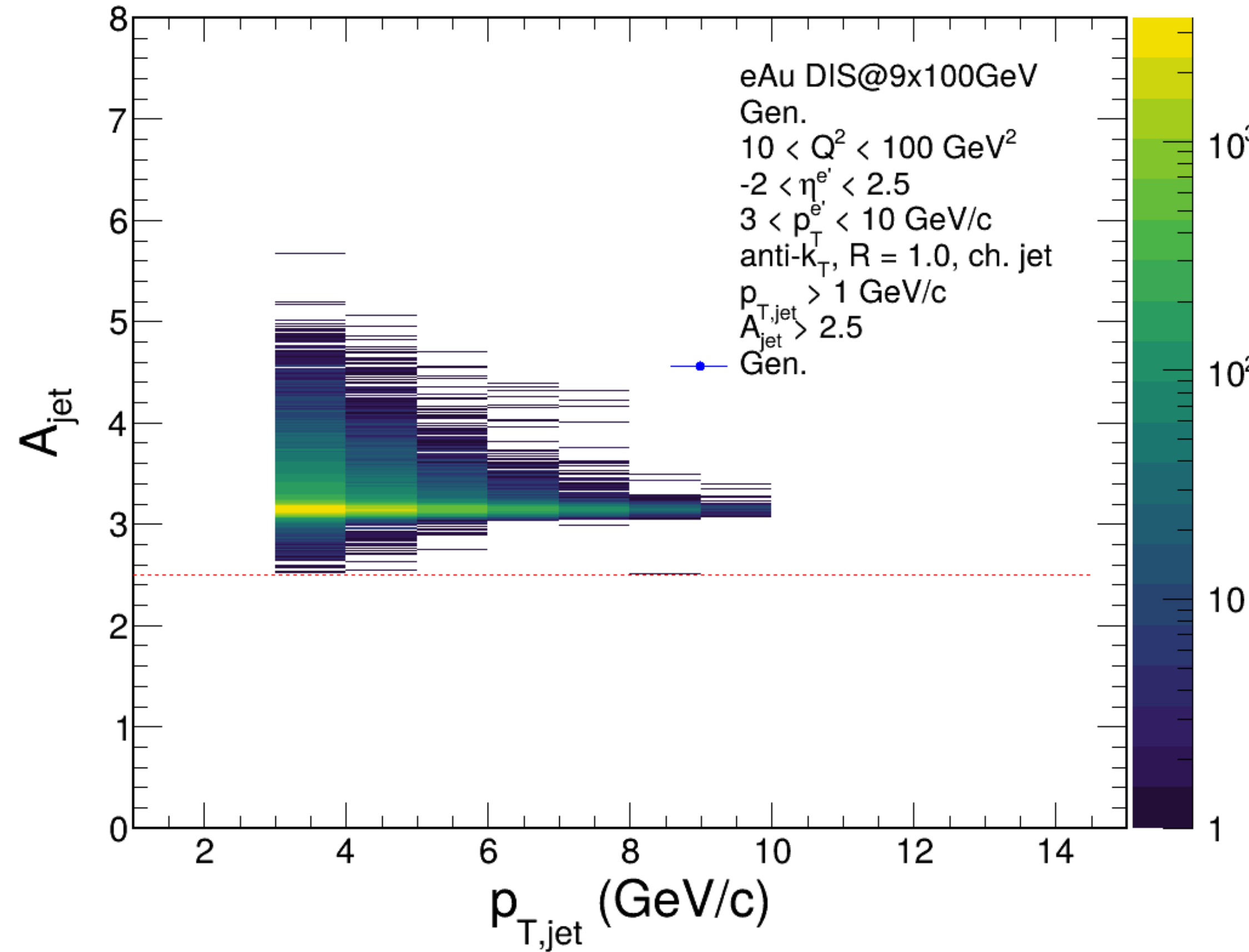
Gen. level

ep



Gen. level

eAu



Gen. level

ep

