

Rho, the Ostrich head in CLAS12 (ep->epX)

FATIHA BENMOKHTAR

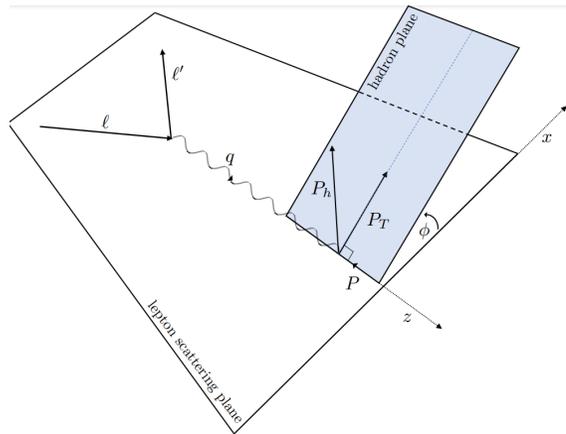
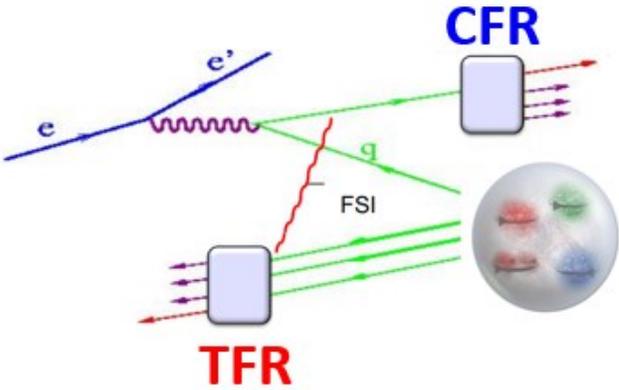
Duquesne University

With: H. Avakian (Jefferson Lab),

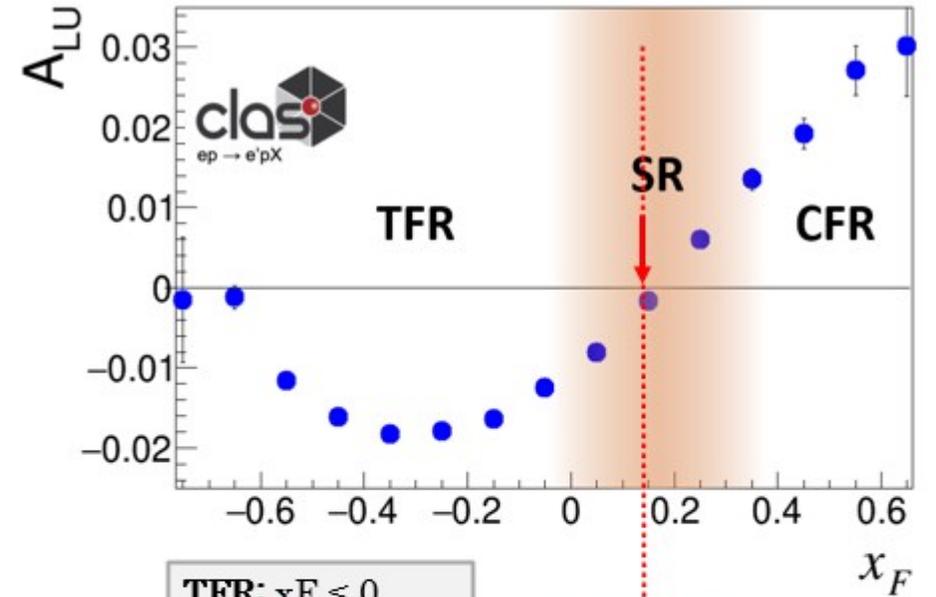
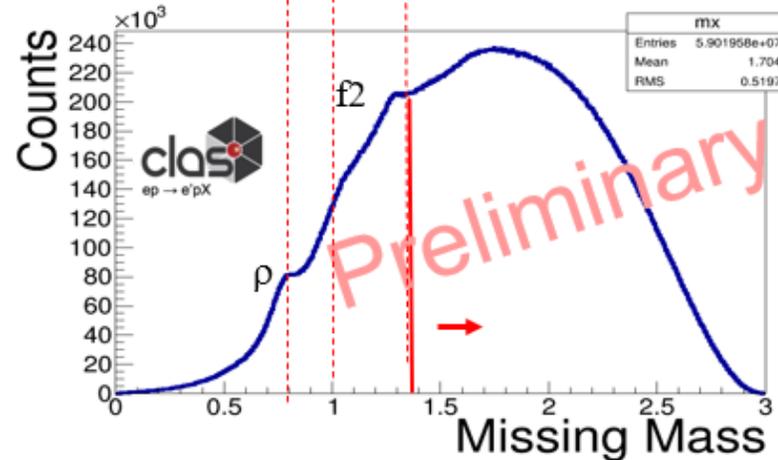
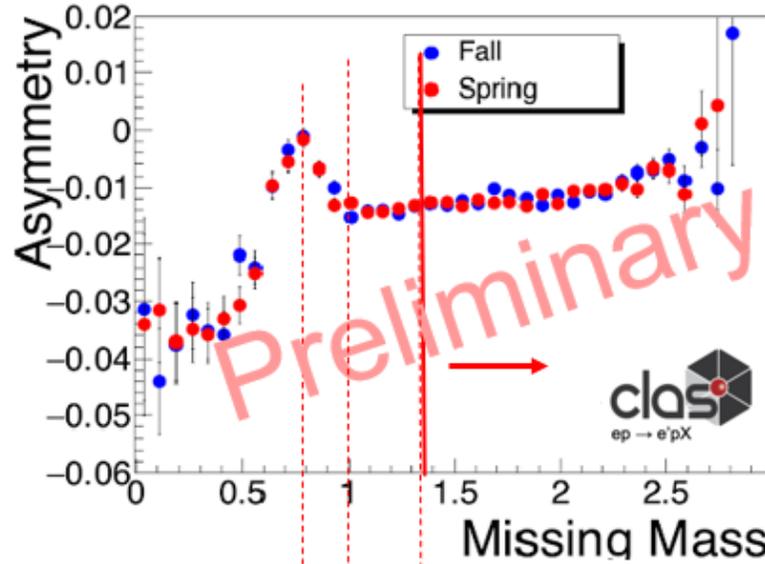
T. Hayward (MIT)

D. Terrero Cepeda , H. Valenty, N. Nicholson, J. Corrazi Gigliotti, N. Carpenter, M. Chitwood, A. Gadsby and A. Boyer (Duquesne)

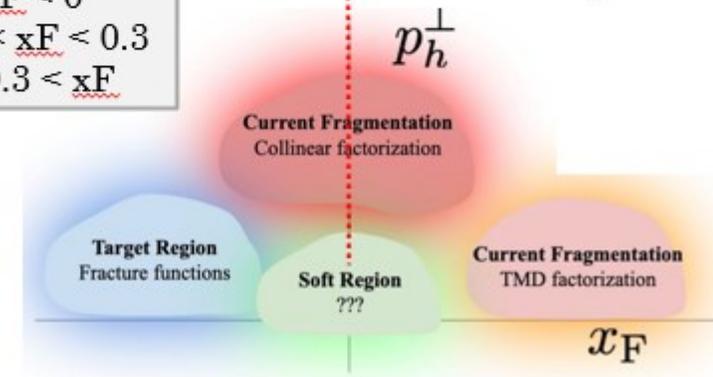
Example of Physics analysis $ep \rightarrow epX$ Fragmentation Regions (Forward detector)



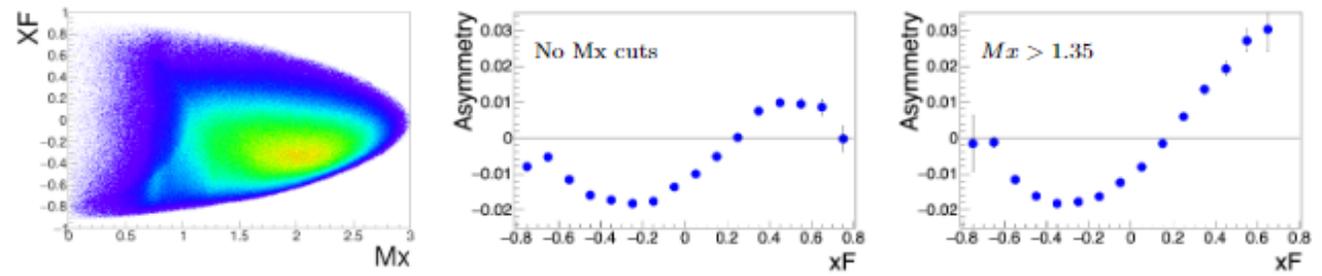
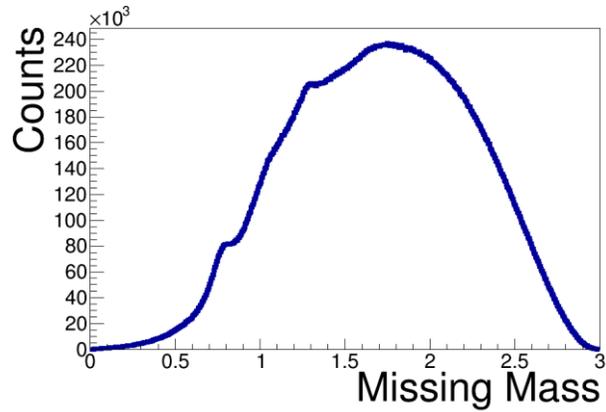
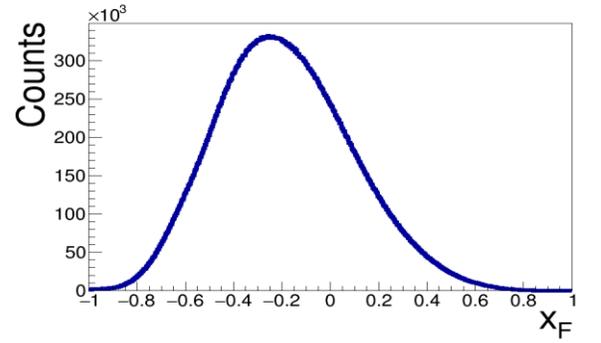
$$A(\phi)_{LU} = \frac{1}{p} \left(\frac{N^+ - N^-}{N^+ + N^-} \right)$$



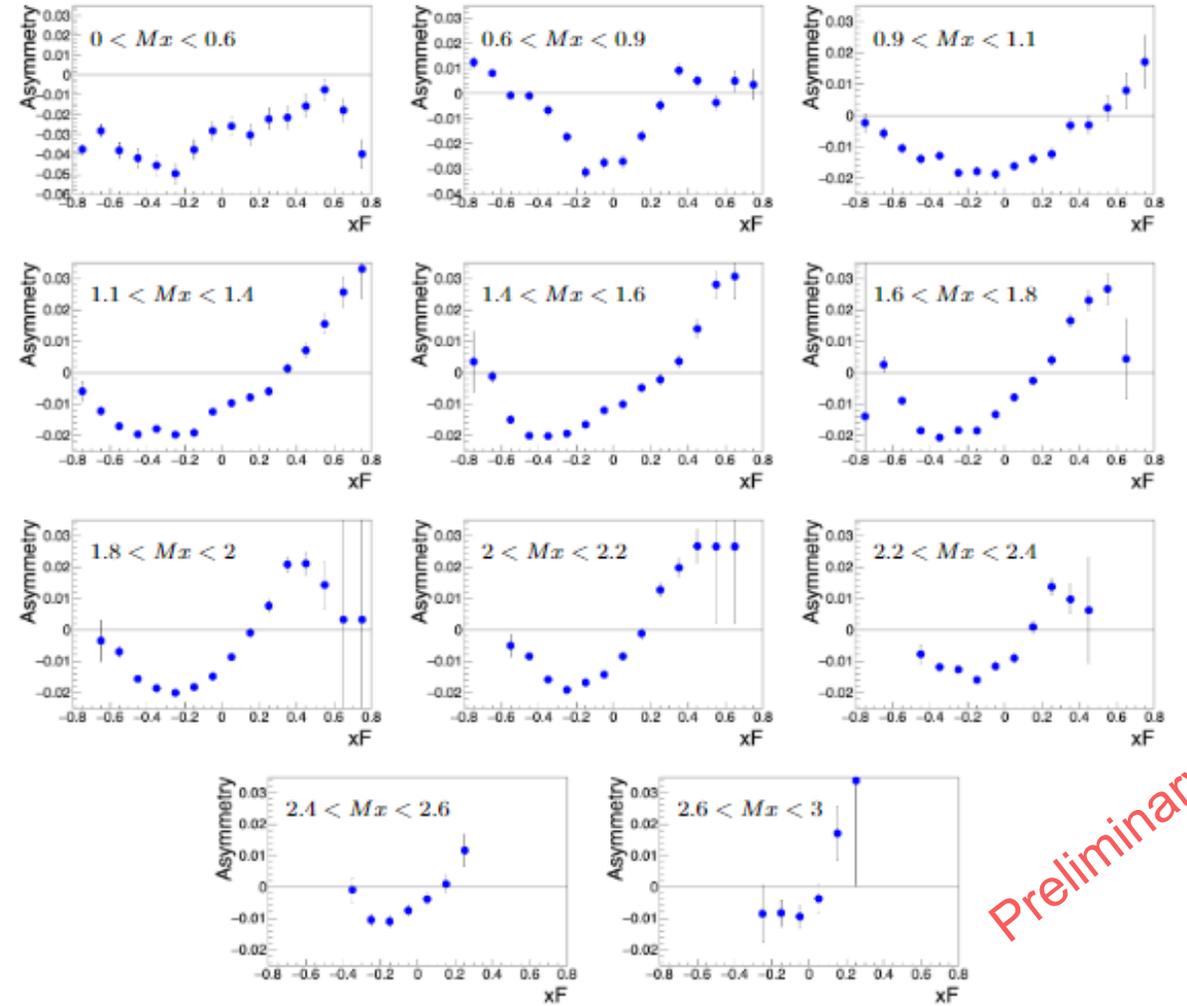
TFR: $x_F < 0$
SR: $0 < x_F < 0.3$
CFR: $0.3 < x_F$



$x_F(M_x)$

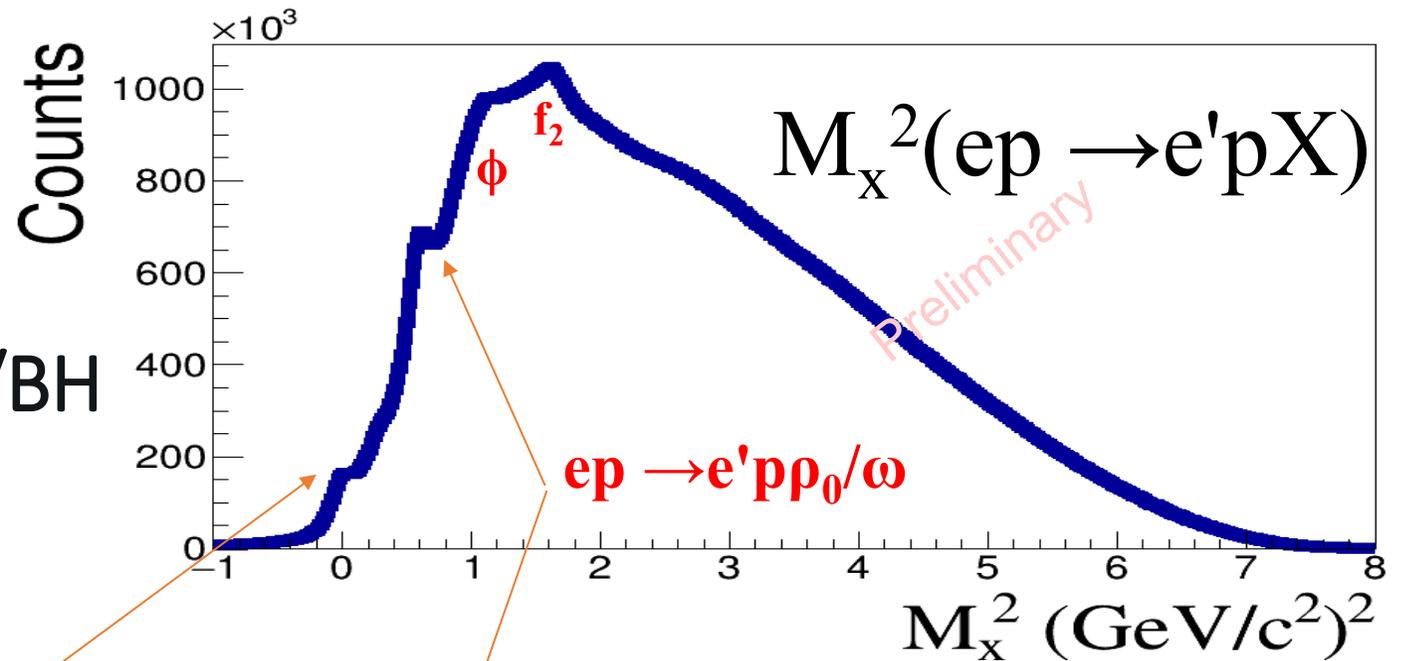


(a) Left: x_F without any cut on M_x , Right: x_F with $M_x > 1.35$ GeV

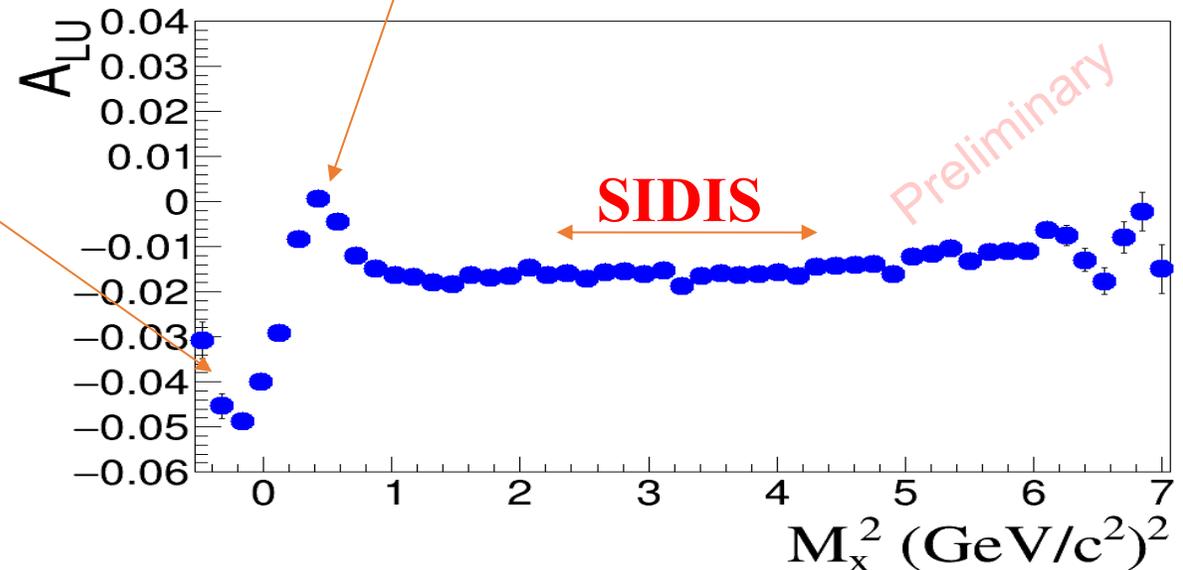


Preliminary

How do we handle
Radiative cont. from exclusive /BH
channels?

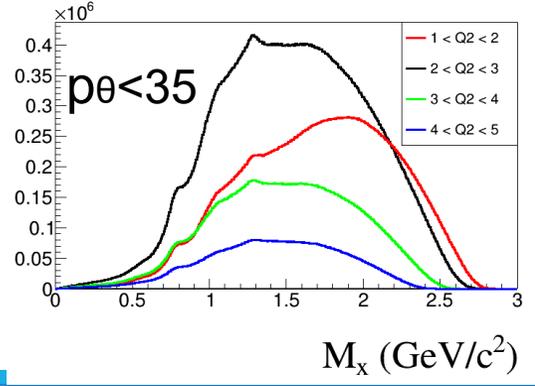
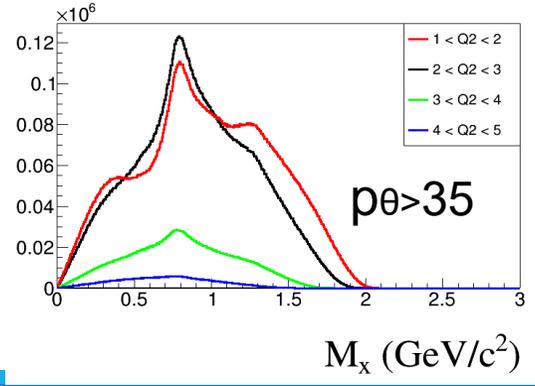
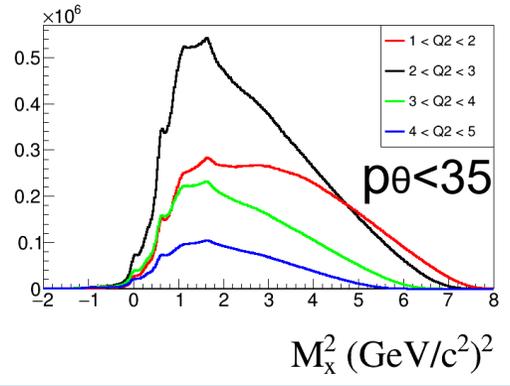
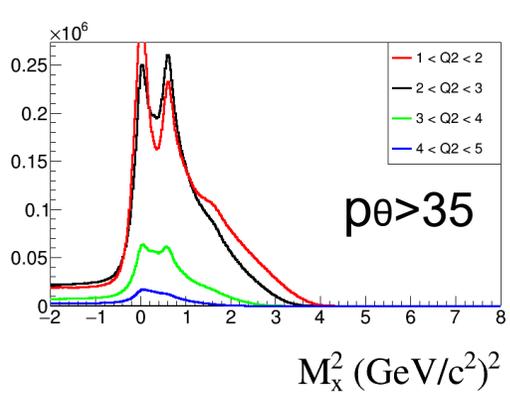
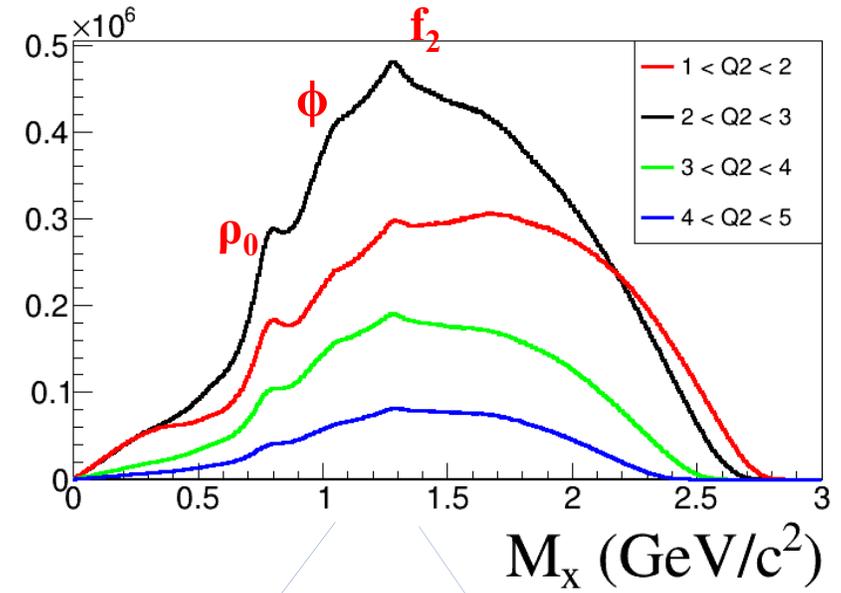
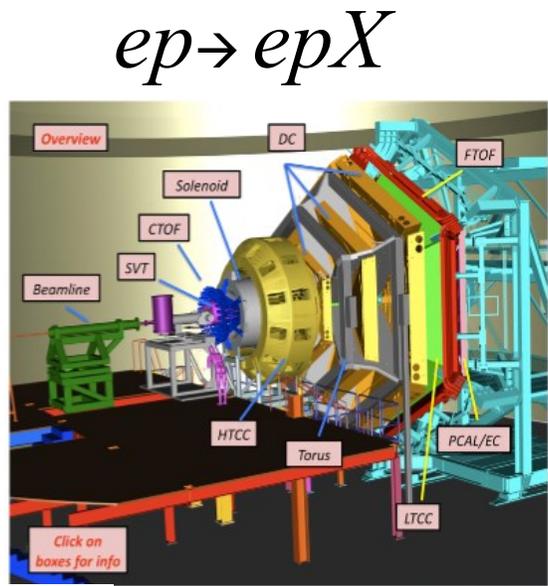
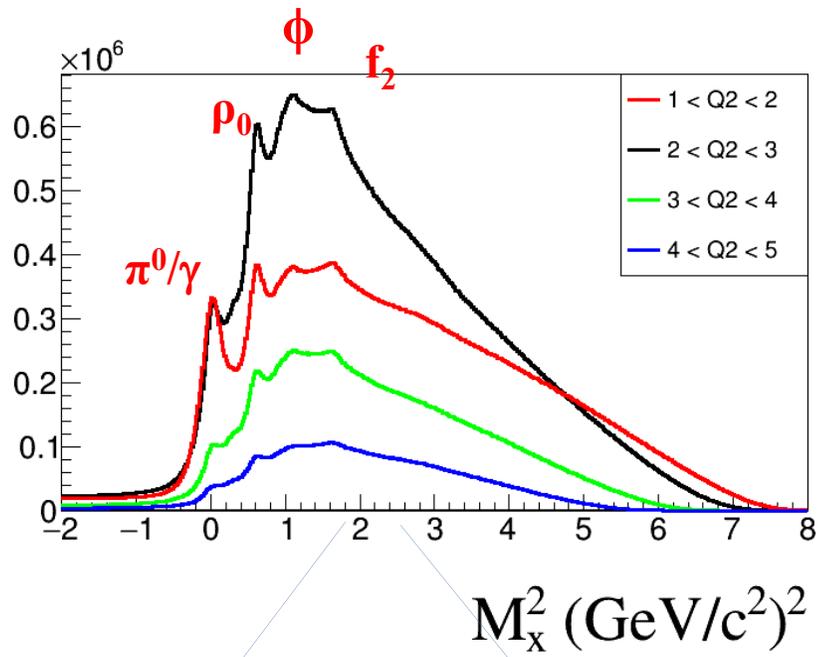


$\text{ep} \rightarrow \text{e}'\text{p}\pi^0 / \text{e}'\text{p}\gamma$



$\text{ep} \rightarrow \text{e}'\text{p}\gamma$ "Bethe-Heitler photons" refer to photons produced through the Bethe-Heitler process, which interferes with the DVCS signal when studying the structure of the nucleon using high-energy electron scattering;

Origins of the resonances (in the detector)

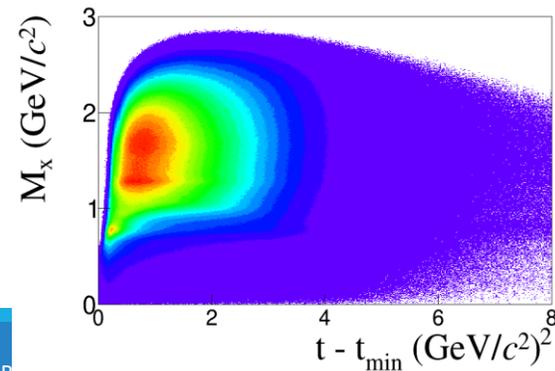
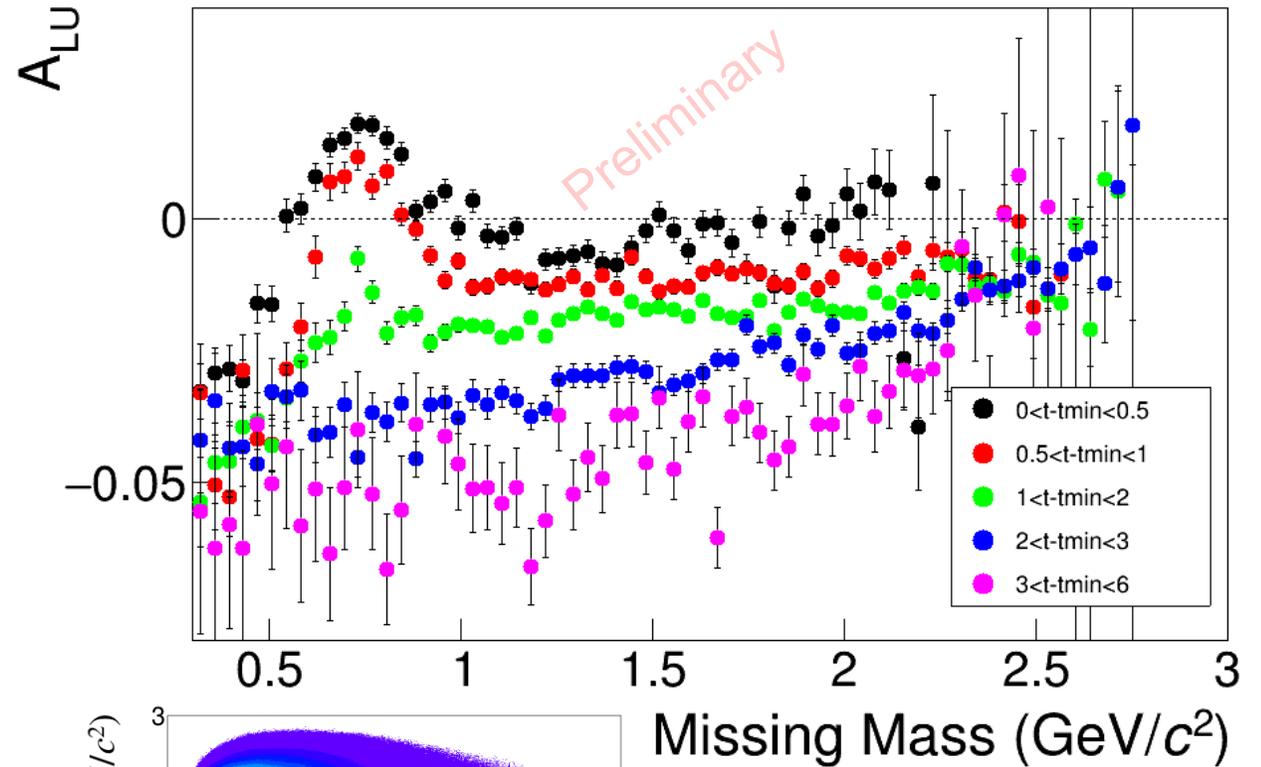
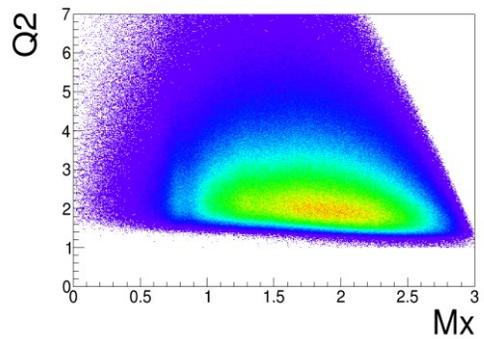
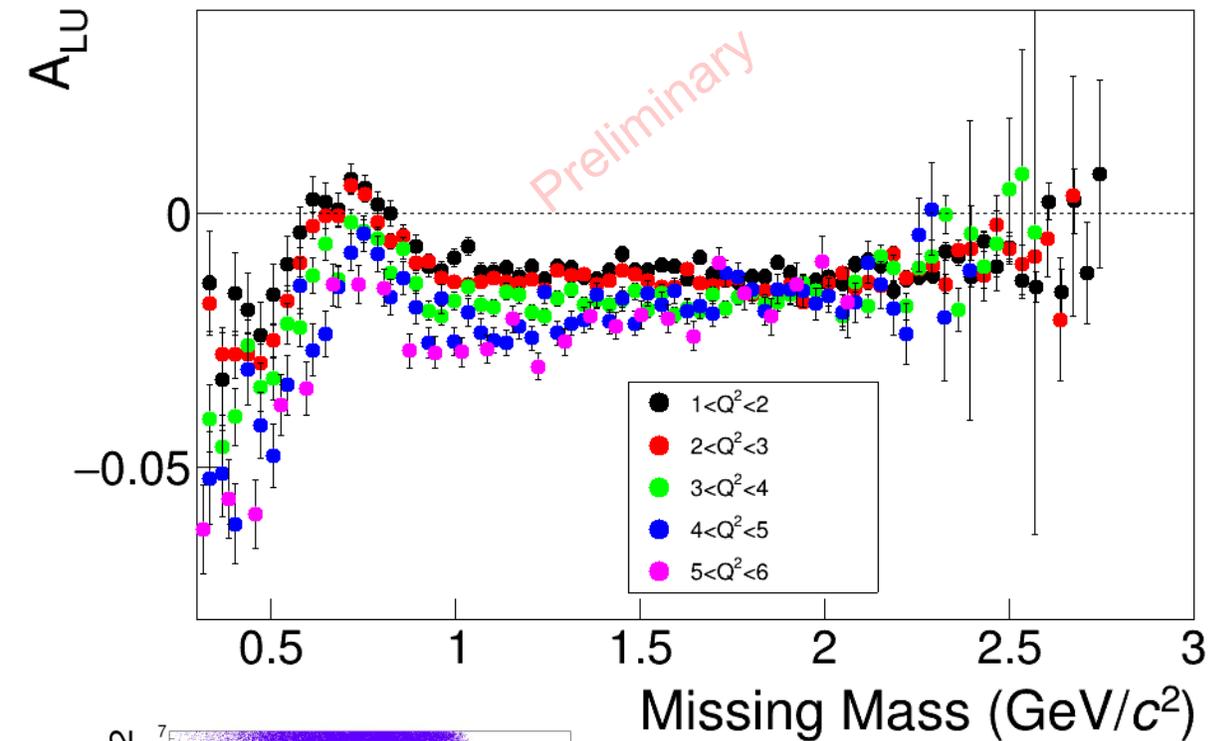


SSA distributions

Q^2 dependence

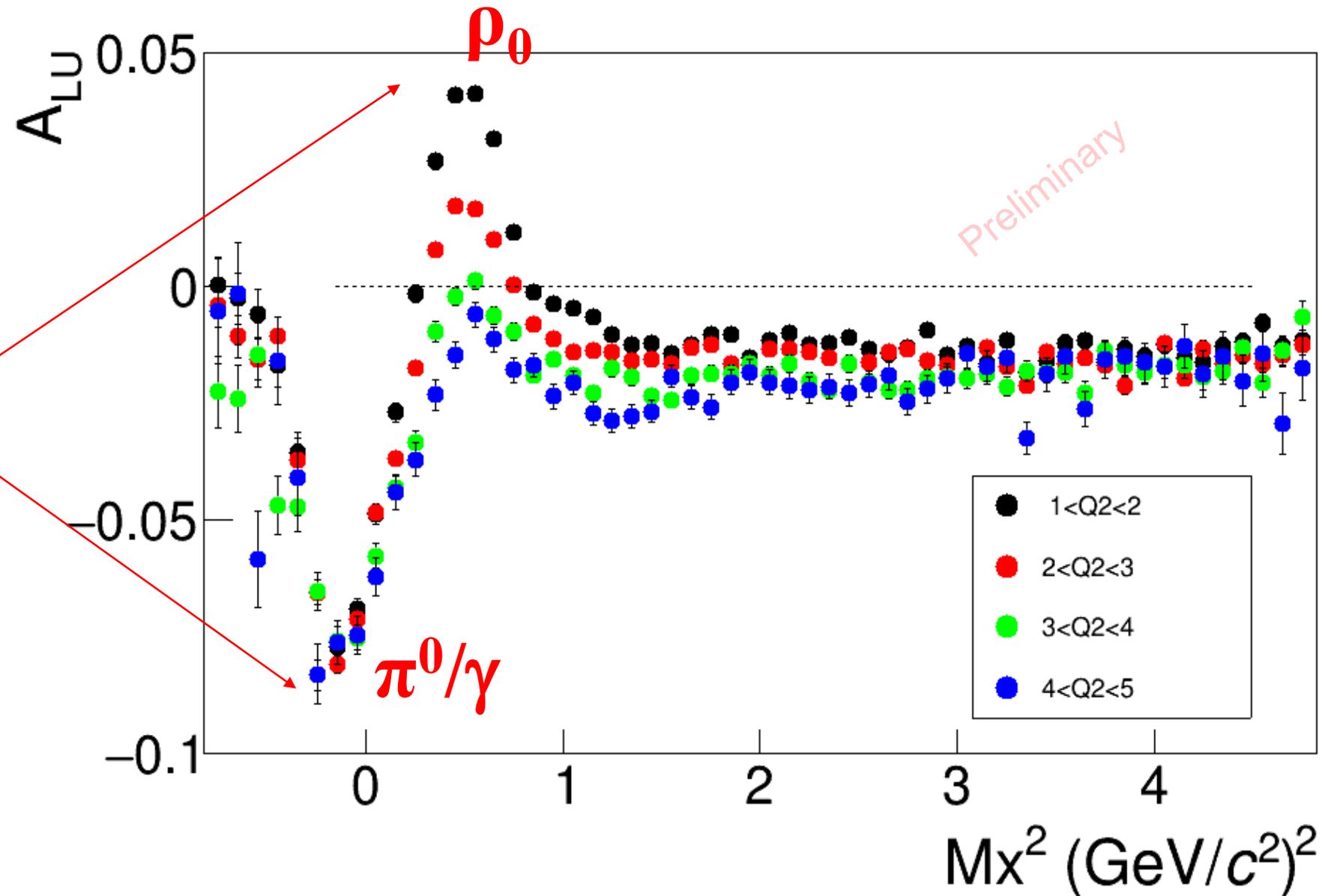
($x_F < 0$, Forward detector)

t dependence



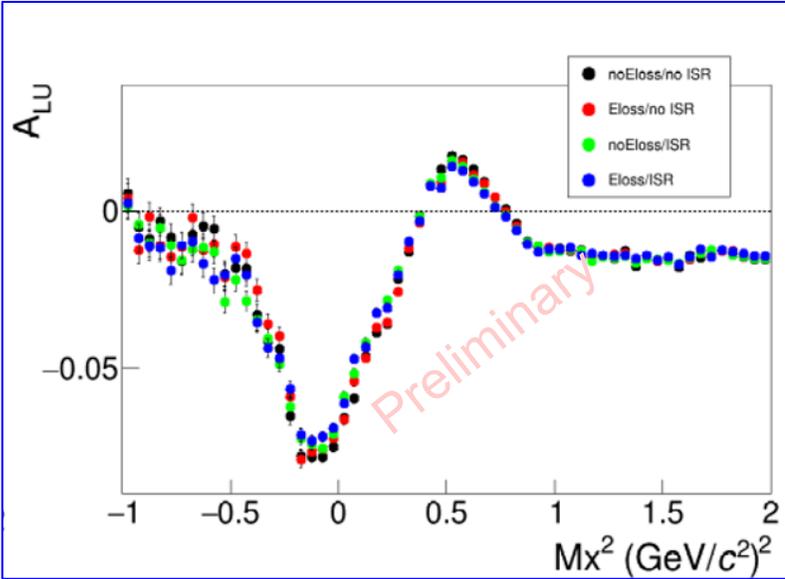
Full detector

Radiative effects from competing channels seems to roughly cancel.

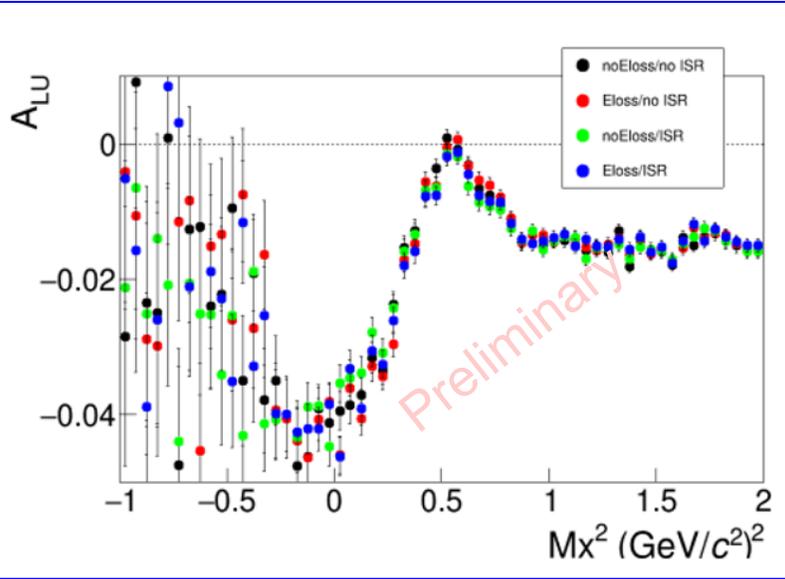


Initial State Radiation studies

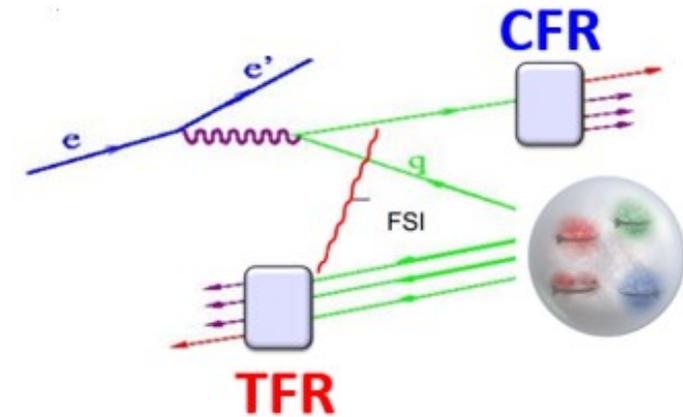
Full detector coverage



Forward detector coverage



Conclusions

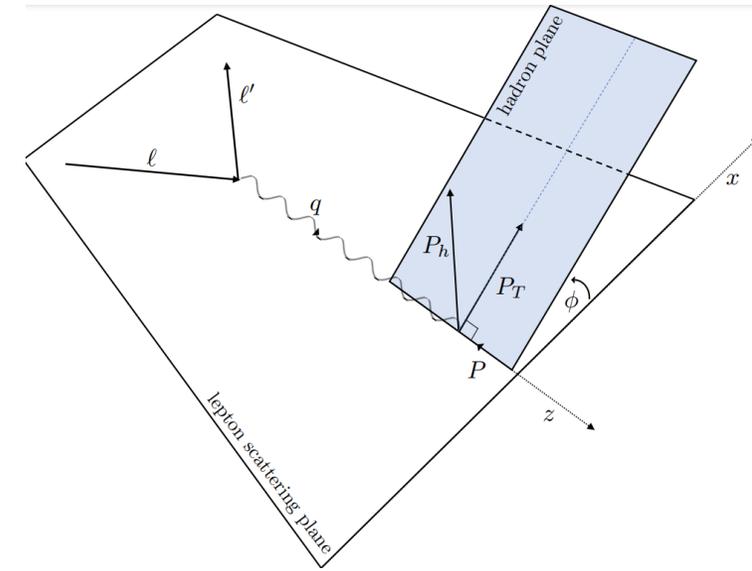


- Rho zero is there, one has to study carefully its contributions to SSA for all the SIDIS hadronic channels.
- Its contribution may be suppressed by a hard cut on missing mass, or working in the good region of Q^2 and t .

SSA Extraction for $\vec{e}p \rightarrow e'p'+X$

$$\frac{d\sigma}{dx dy d\zeta dP_T^2 d\phi_h} = \hat{\sigma}_U \left\{ F_{UU} + \sqrt{2\varepsilon(1+\varepsilon)} F_{UU}^{\cos\phi_h} \cos\phi_h \right. \\ \left. + \varepsilon F_{UU}^{\cos 2\phi_h} \cos 2\phi_h + \lambda_\ell \sqrt{2\varepsilon(1-\varepsilon)} F_{LU}^{\sin\phi_h} \sin\phi_h \right\}$$

Fracture Function



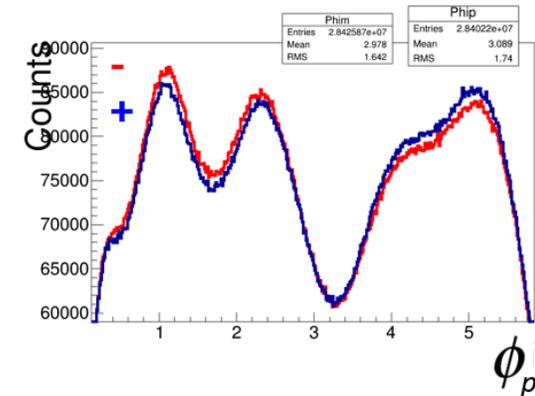
Method: Study Asymmetry modulations :

$p_0 + p_1 \sin(\phi) + p_2 \sin(2\phi)$ for different variables: P_T , Q^2 , x , etc...

Extract $A(\phi)_{LU} = \frac{1}{p} \left(\frac{N^+ - N^-}{N^+ + N^-} \right) \rightarrow$

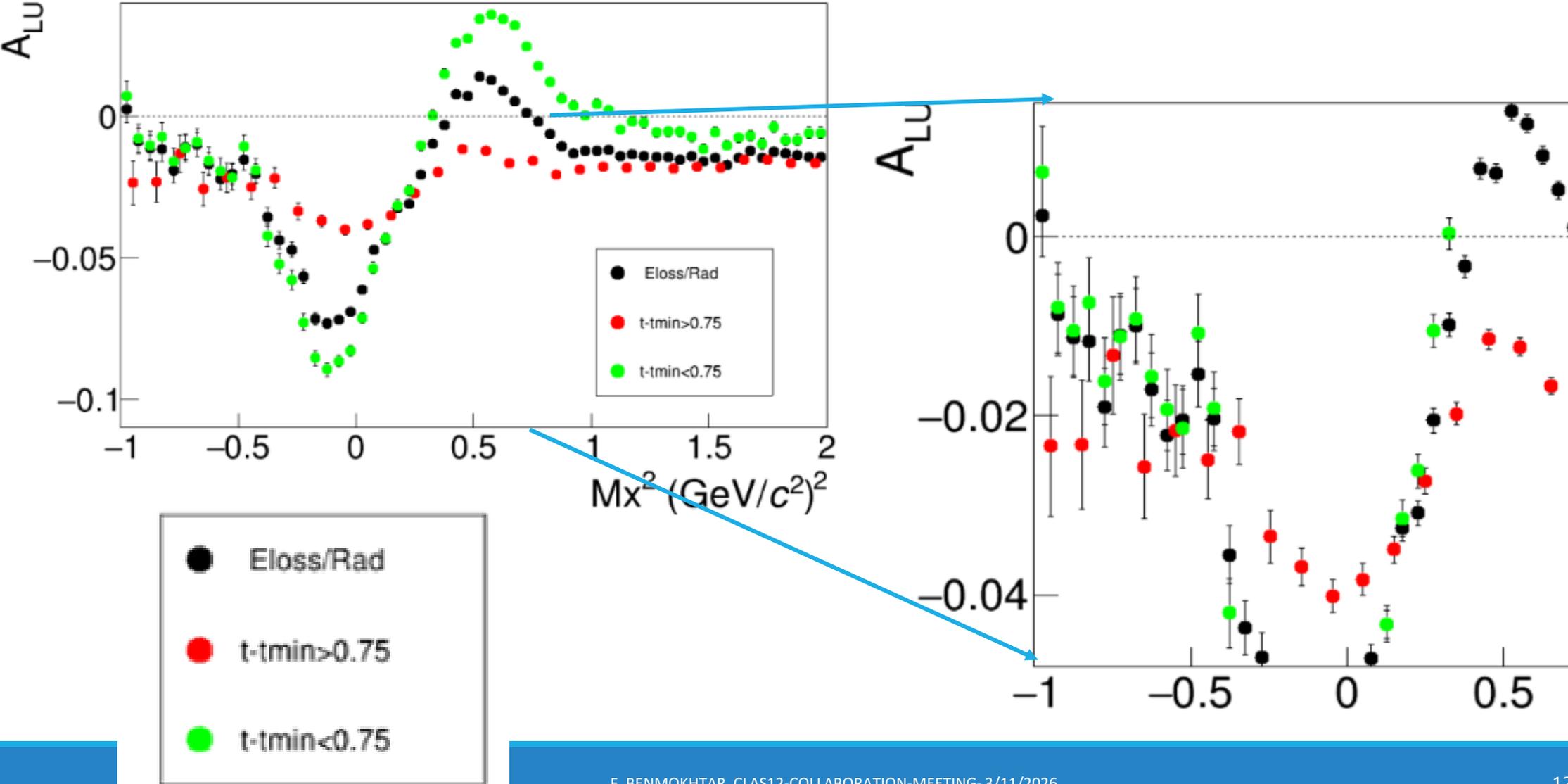
$$\frac{F_{LU}}{F_{UU}} = \frac{A_{LU}}{\sqrt{2\varepsilon(1-\varepsilon)}}$$

Depol. fac.

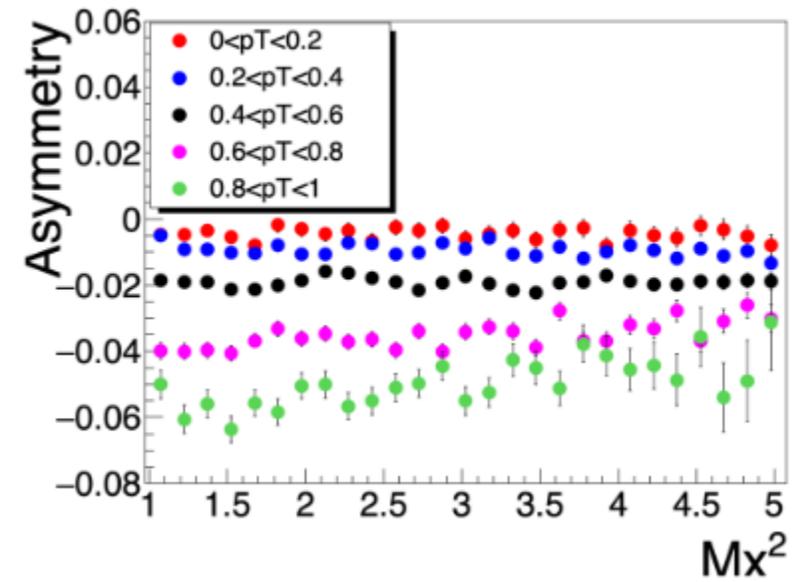
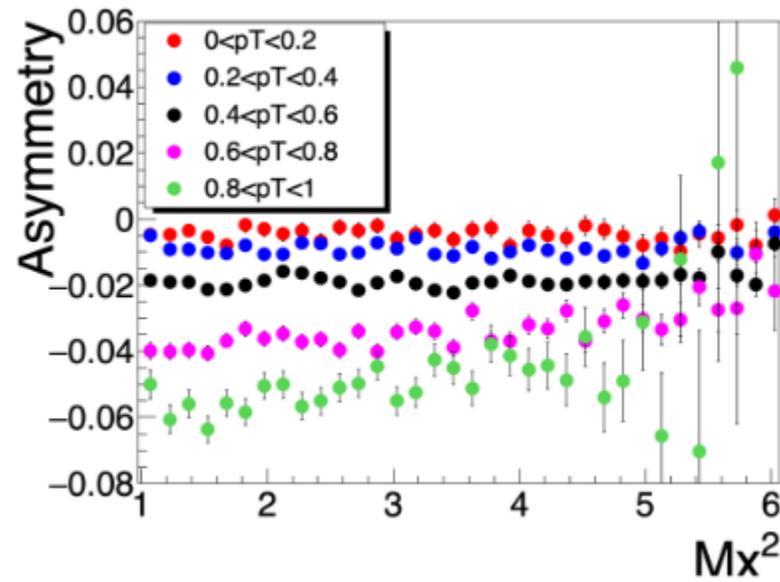
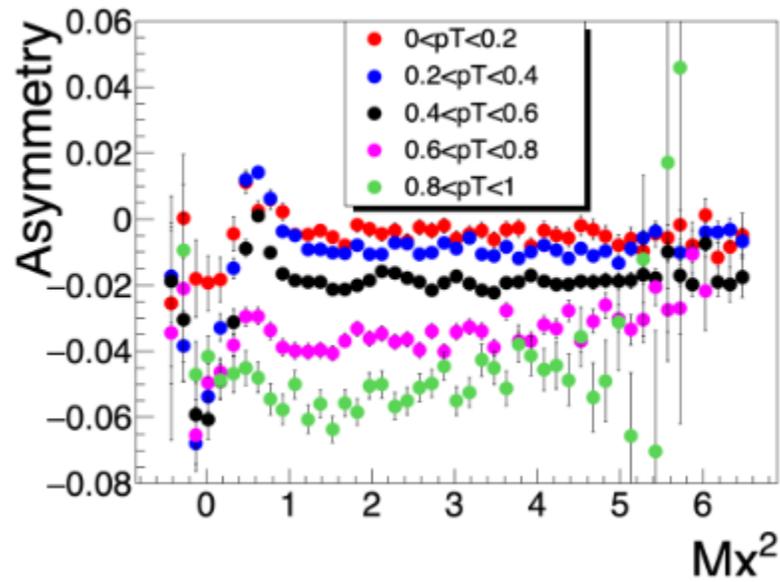


Thank you

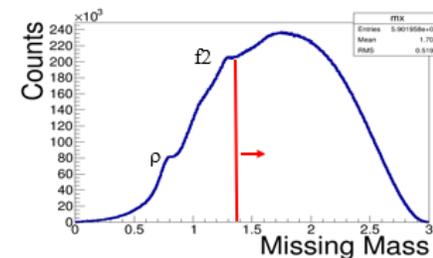
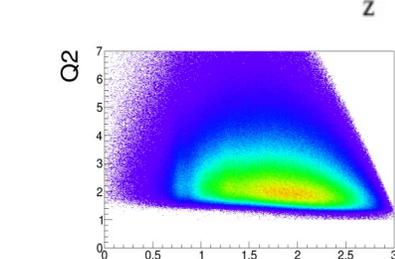
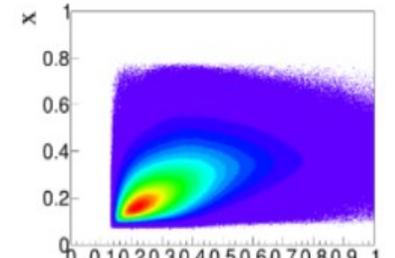
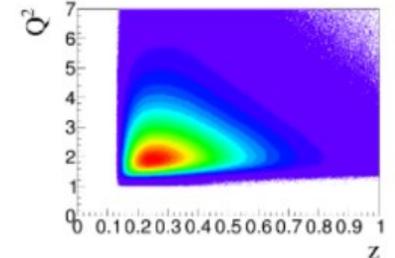
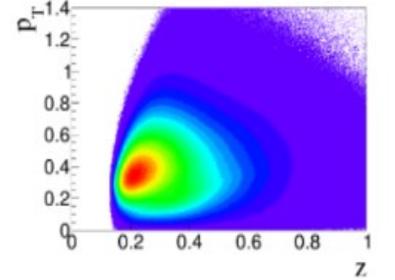
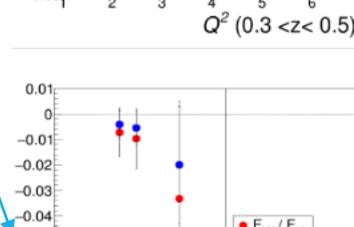
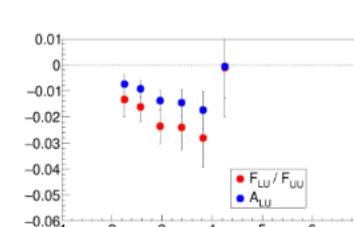
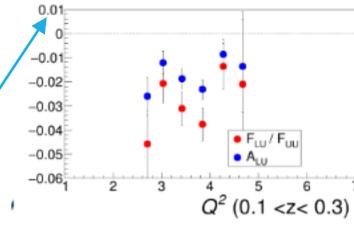
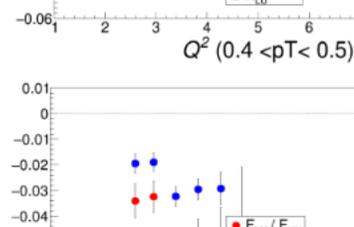
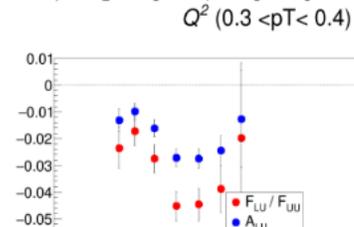
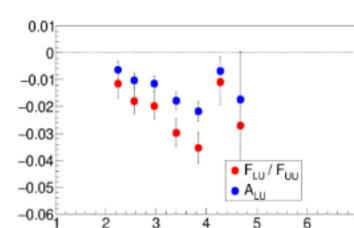
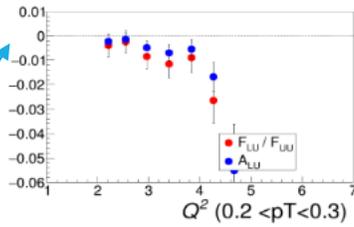
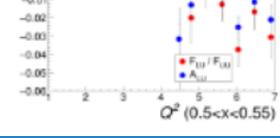
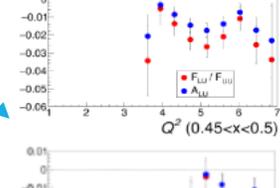
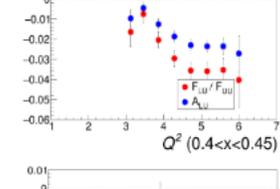
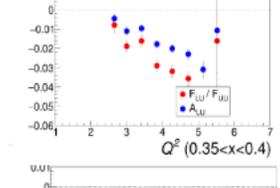
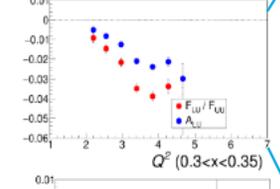
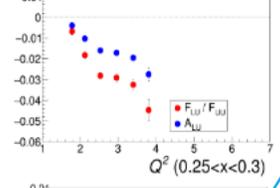
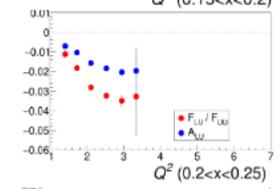
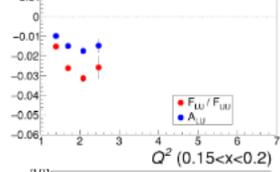
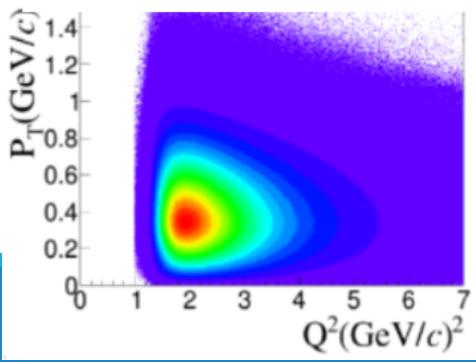
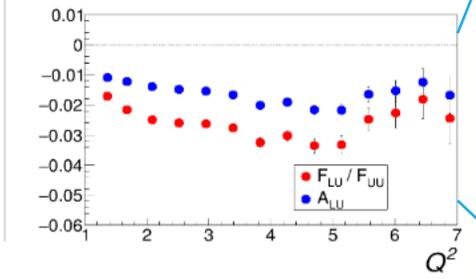
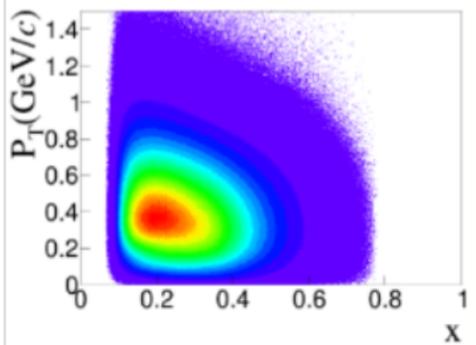
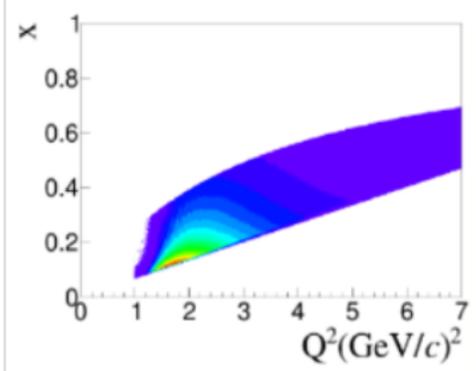
The issue with the -0.2 shift



PT dependence



$Q^2(x, P_T, z, M_x)$



Sine Fit Equation

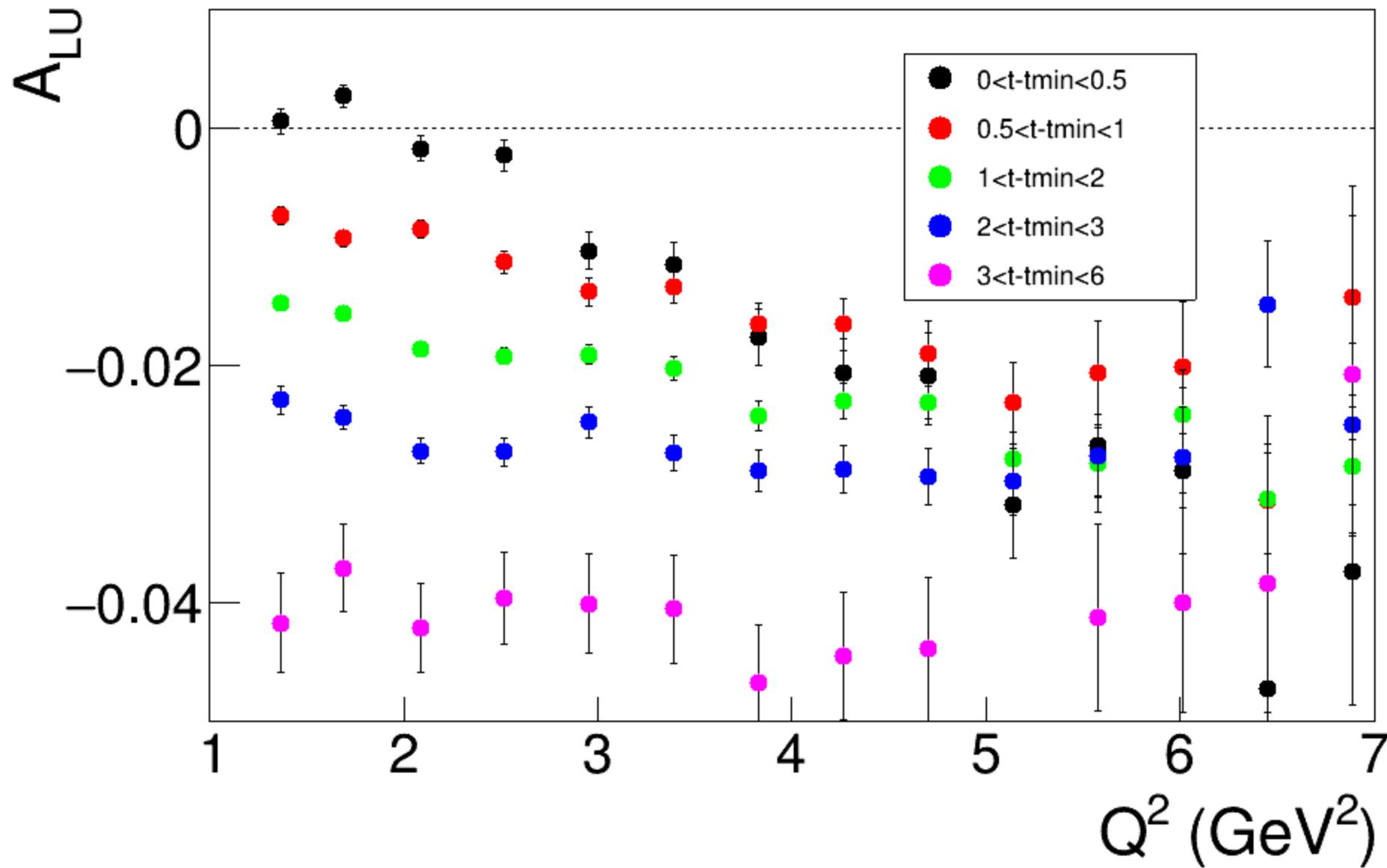
$$p_0 + p_1 \sin \varphi + p_2 \sin(2 \varphi)$$

$$\text{FLU} \propto P (\text{perp.})^2$$

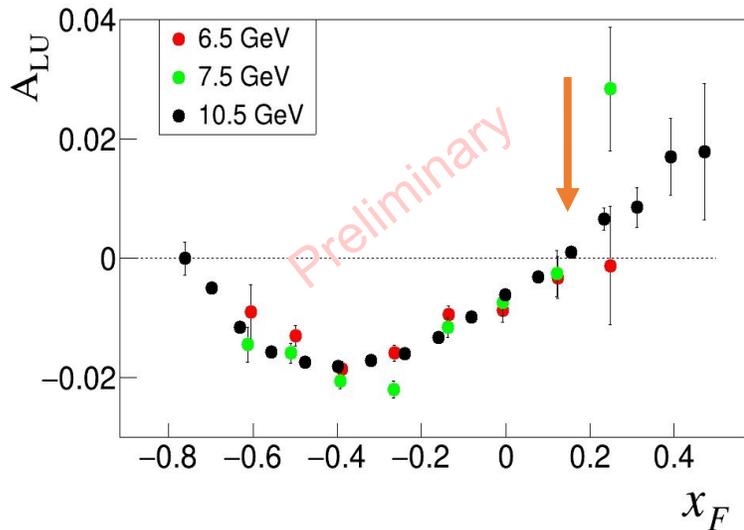
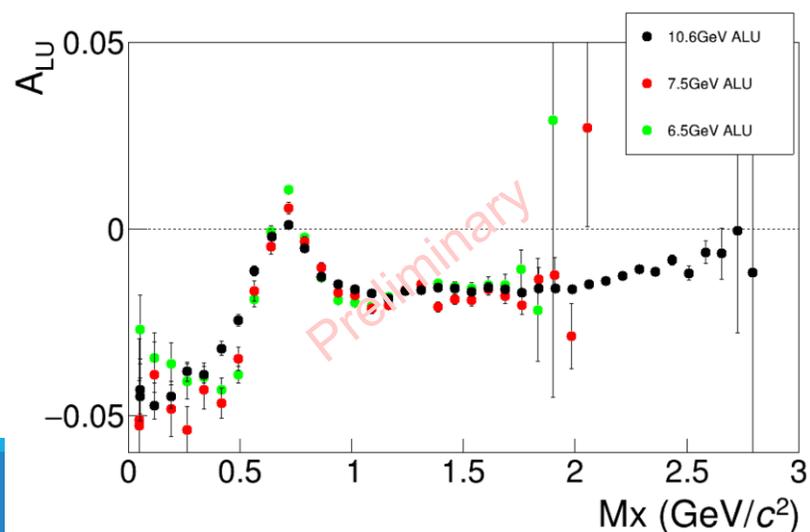
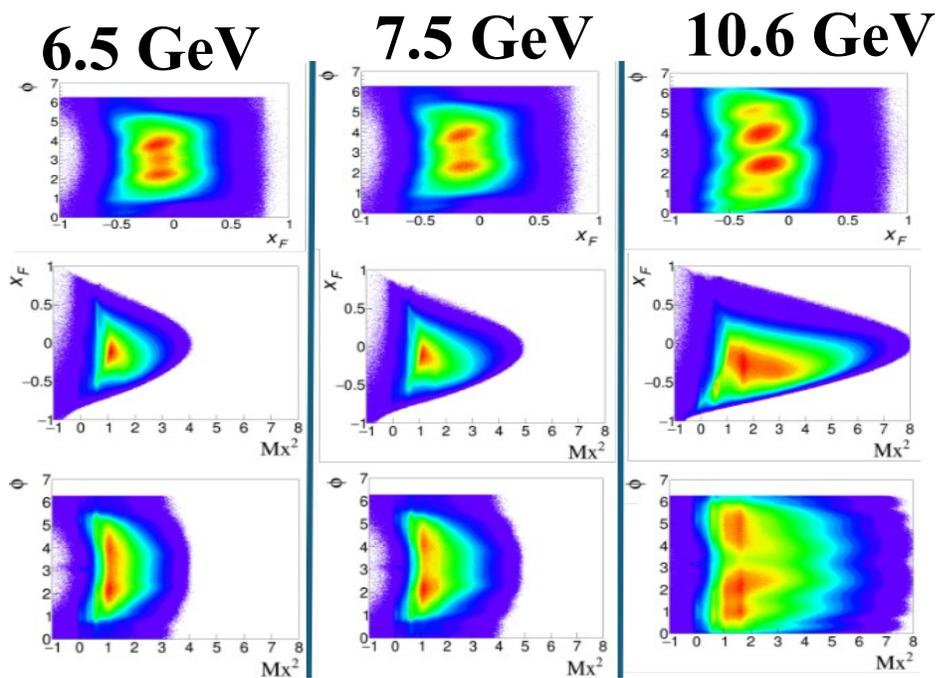
With Taylor expansion: $(1 + \cos x)$

Existing sin multiplied: $\sin x(1 + \cos x)$

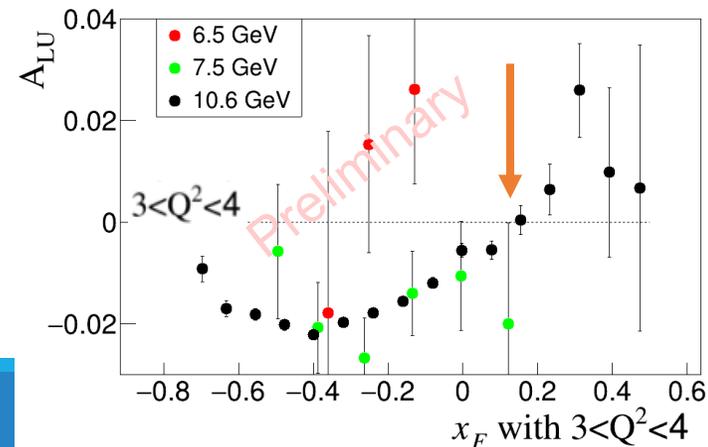
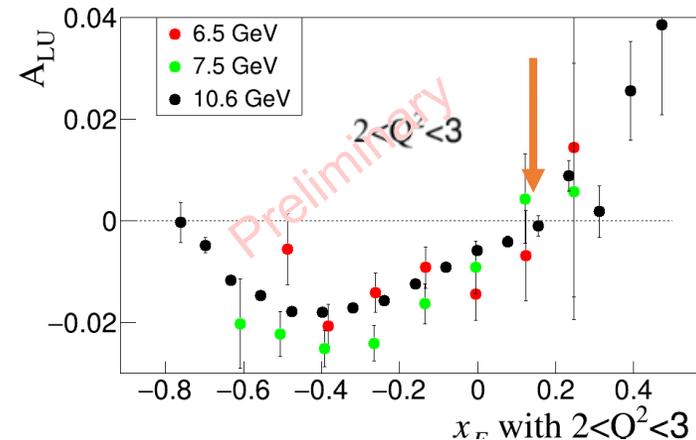
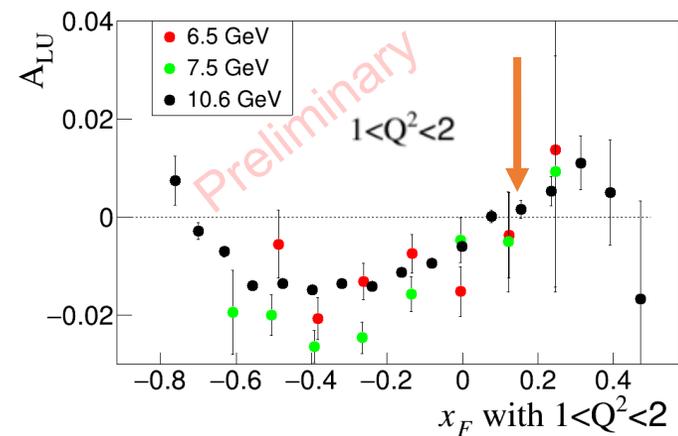
$$A \sin x + B \sin 2x + C$$



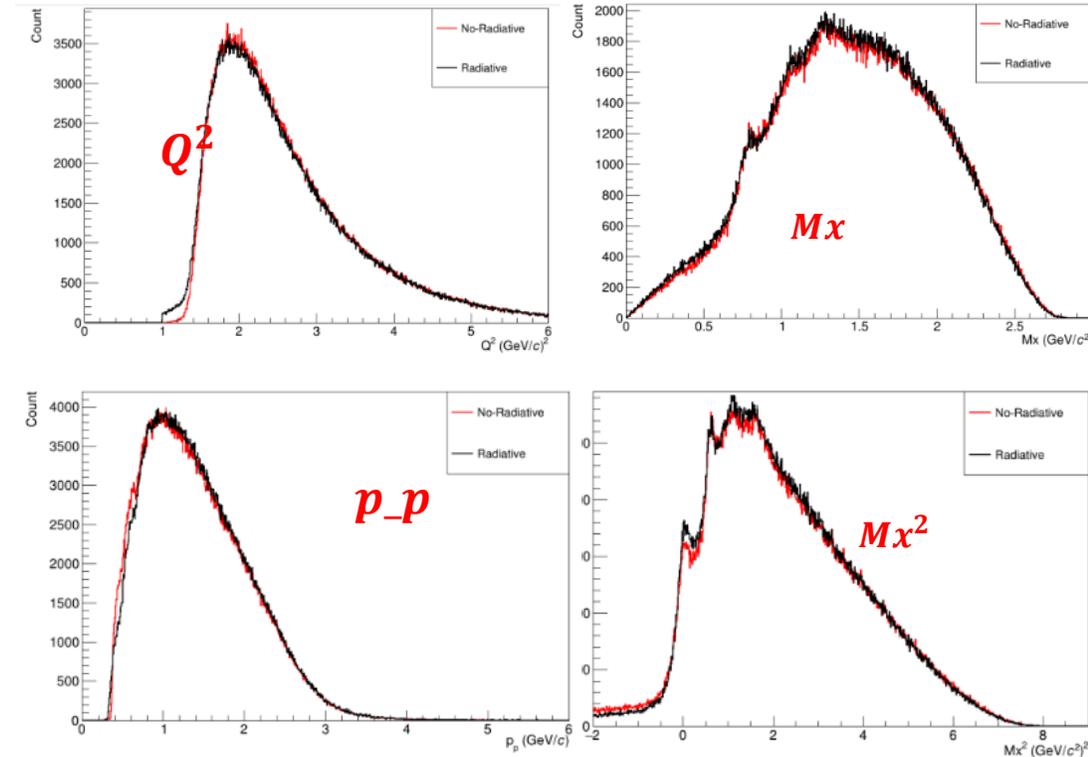
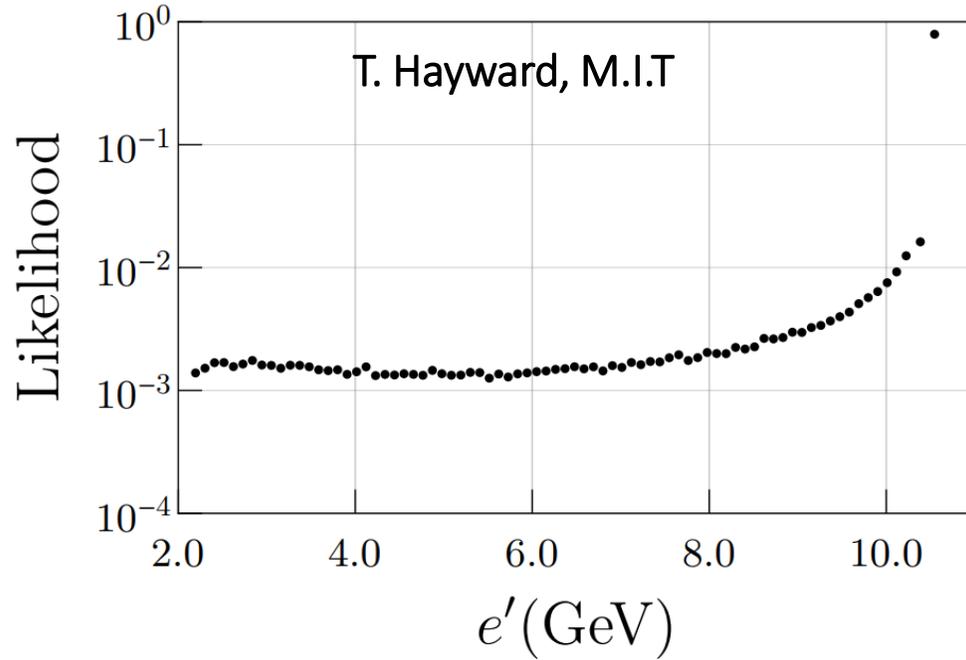
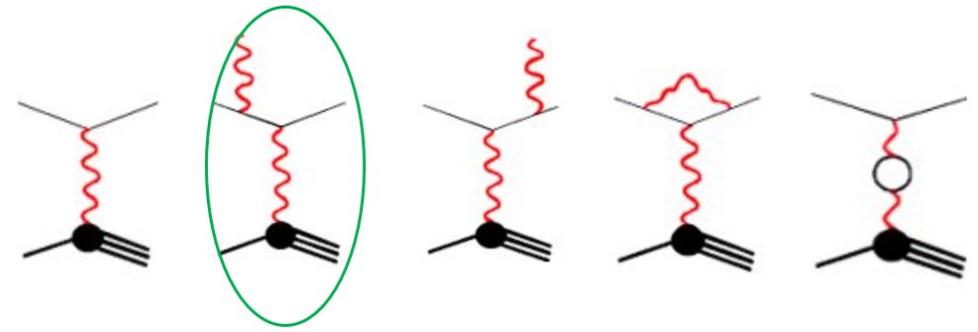
Evolution with Beam Energy



No big change in SSA, hint that Rad Corr will be small.



Electron Initial State Radiation studies



RADGEN, used within the Pythia event generator, calculates radiative corrections by simulating the emission of additional photons from charged particles involved in a scattering process, effectively accounting for the quantum fluctuations of the electromagnetic field and adjusting the kinematics of the primary event.