KAON SIDIS ANALYSIS

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CLAS12 Collaboration Meeting – November 2026

Single- and Double-Spin-Asymmetries extraction with a polarized NH_3 target with the RG-C dataset of CLAS12.

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PRELIMINARY RGC ANALYSIS

We will consider **SIDIS** processes with at least one K^+ in the final state with a **longitudinal polarized fixed target** of $\boldsymbol{NH_3}$ for the Inbending **Run Group C** dataset.

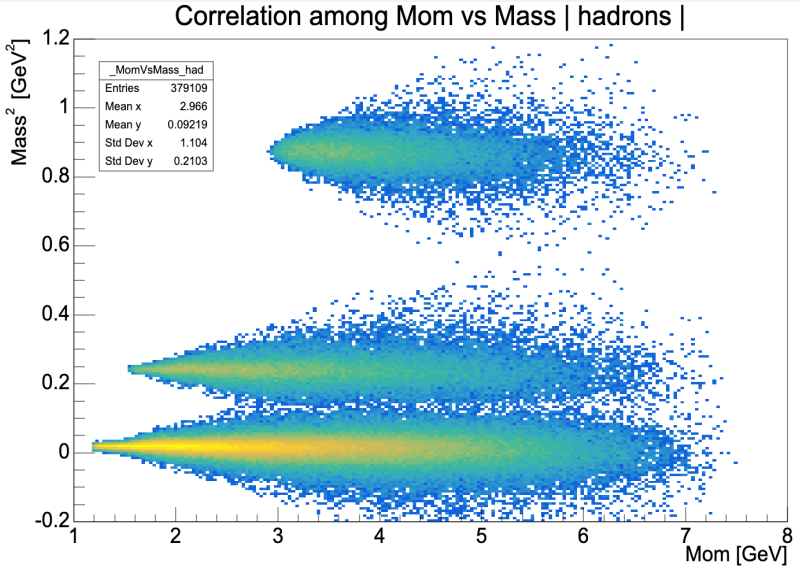
Fiducial cuts:

- QADB selection
- Vertex cuts: $|V_{X,Y}| < 2$ cm && sum22: $-9 \leq V_Z \leq 1$ cm && fall22/spring23: $-7.5 \leq V_Z \leq 2.5$ cm.
- $W \geq 1.95\ GeV$, $Q^2 > 0.95\ GeV^2$, $0.2 < y \leq 0.8$, $x_F > 0$, $z \geq 0.2$, $P_e > 2.2\ GeV$, $|\chi^2_{PID}| \leq 3$.
- PCAL: (> 0.07 GeV) $L_V, L_W > 13.5$ cm except for sector 1 where we select $L_V, L_W > 22.5$ cm.
- DC: e^-: $edge_1 > 4cm$, $edge_2 > 5cm, edge_3 > 8cm$. K^+: $edge_1 > 3cm, edge_2 > 3cm, edge_3 > 7cm$.
- PID: **ToF**: $1.2 < mom < 3$ GeV & **RICH**: $mom > 1.5\ GeV$; $sector_1: OFF$; $sector_4: ON$ ($off\ layer\ 3$).

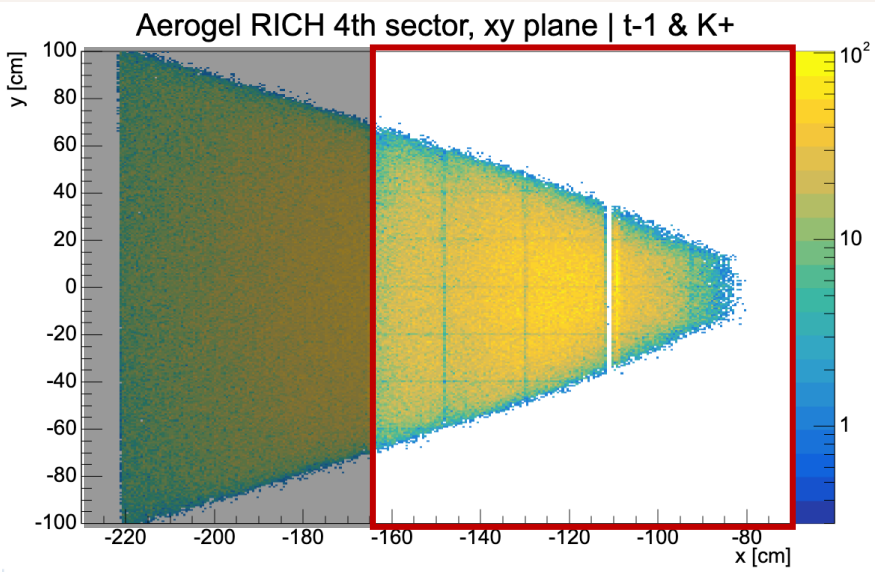
TWO RICH DETECTORS

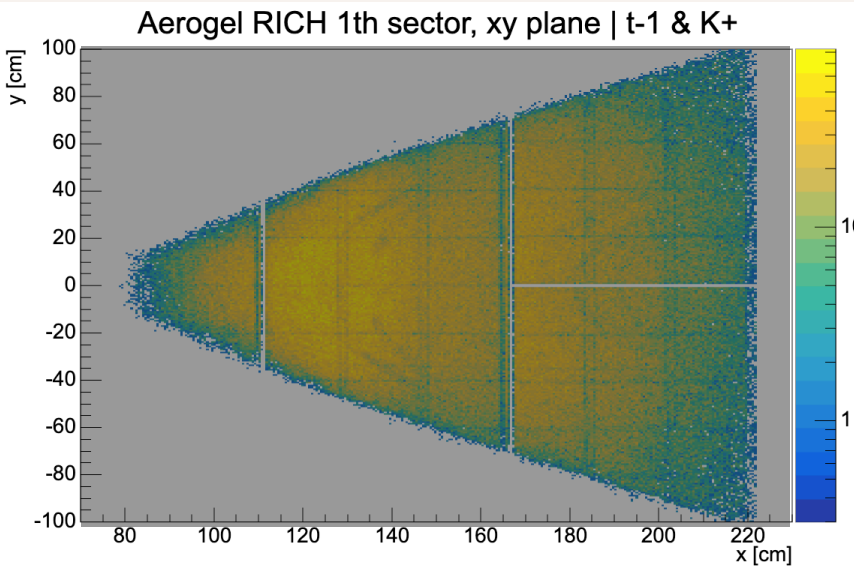
RGC will also use two **RICH detectors** to cover **high momentum range**, up to ~8 GeV (since the ToF provide strong π/K separation until ~3 GeV).

The RICH calibrations and alignment for RGC is almost done! But not yet integrated, thus, this analysis is **conservative** due to the limited acceptance.



RGA RICH mass reconstruction vs momentum.

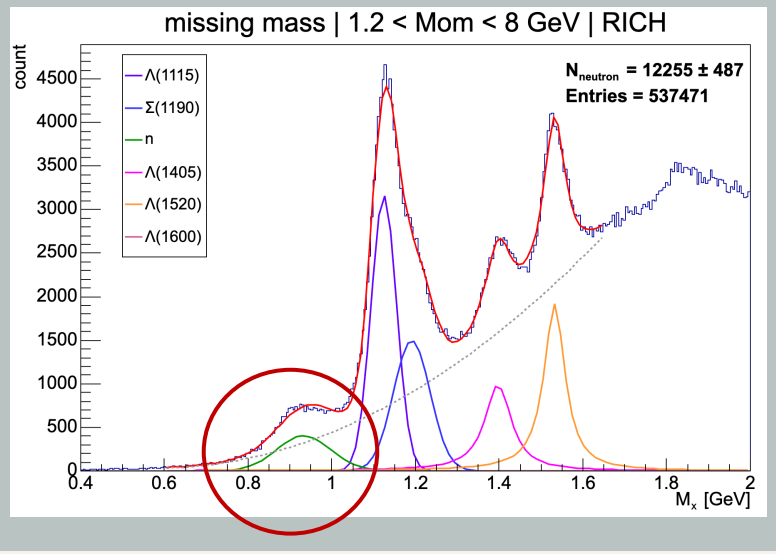




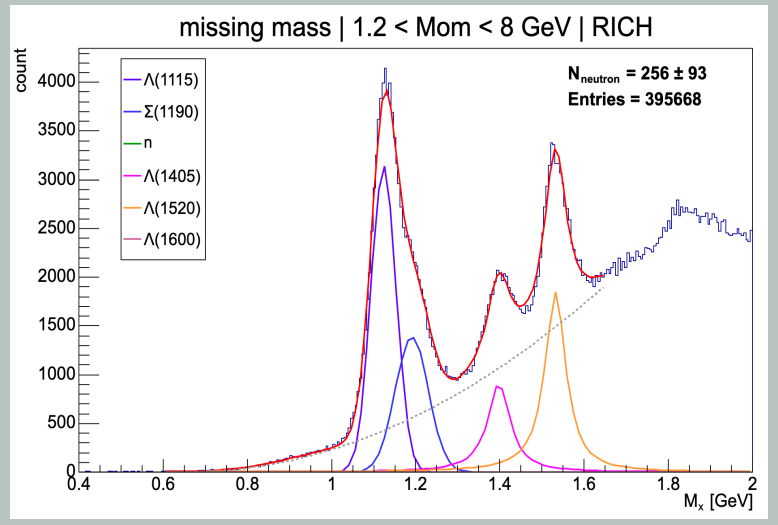
The RICH sector 4 and 1 with the **OFF layers** highlighted.

TWO RICH DETECTORS

The calibration of the **RICH** in **sector 4** currently relies on a provisional set of RICH quality parameters, developed based on missing mass studies with the **RG-A pass2** configuration.

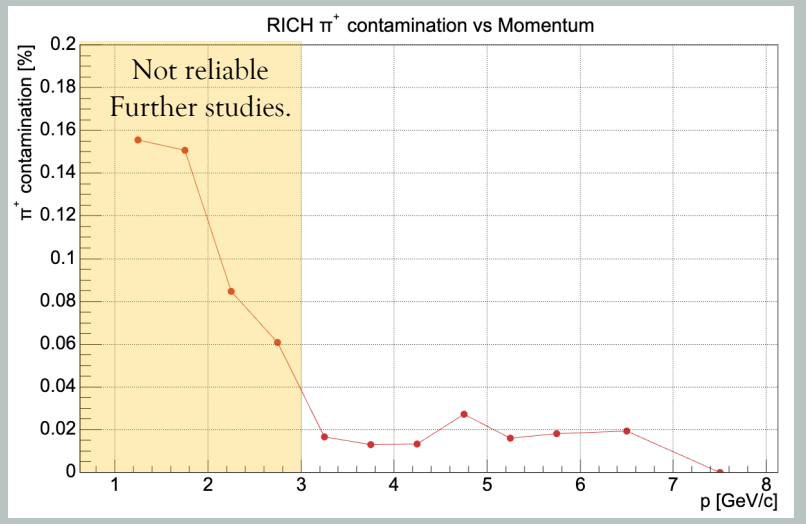


No selection cut, only $n_\gamma \neq 0$.



$RQ > 0.1$ && $n_\gamma > 2.5$ && $RL < 6$

For $\boldsymbol{\chi^2_{RICH} < 50}$: $\boldsymbol{RQ \geq 0.04RL - 0.02}$. For $\boldsymbol{\chi^2_{RICH} > 50}$: $\boldsymbol{RQ \geq 0.06RL - 0.08}$

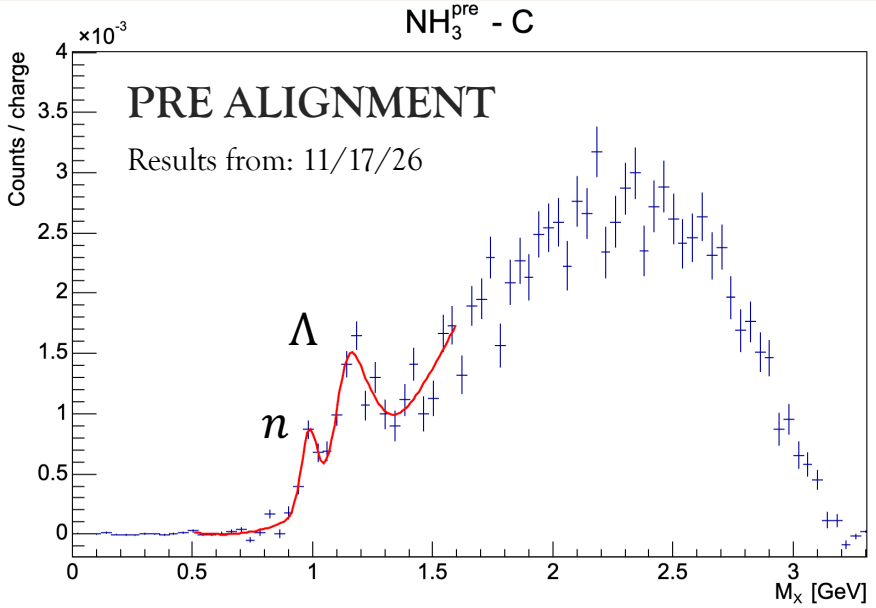


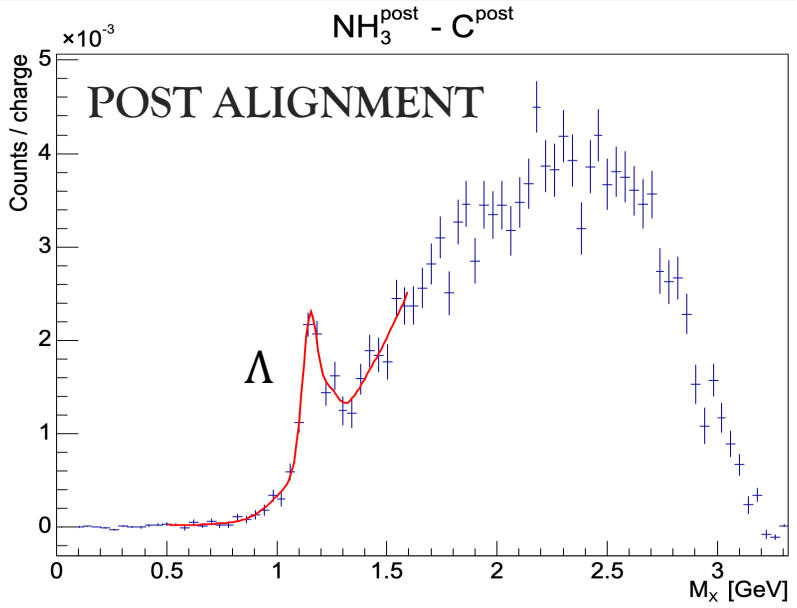
Old measurement of the contamination.
After the new alignment, a new study will be done

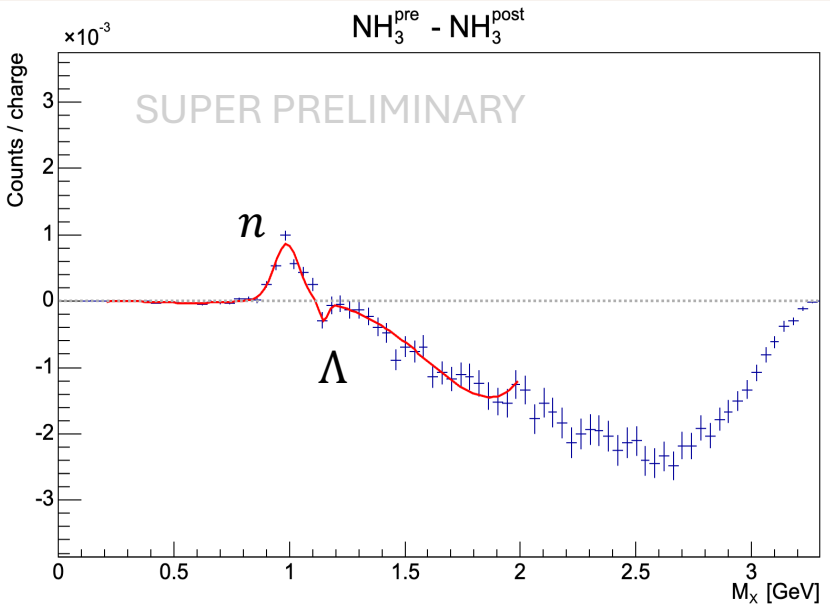
FIRST ALIGNMENT RESULTS - NOV. 17TH

Missing mass spectrum as: $\frac{M_x^{pre}(NH_3)}{Q_{acc}} - \alpha \frac{M_x(C)}{Q_{acc}}$ with $\alpha = PF \frac{L_{NH_3}\rho_{NH_3}}{L_C\rho_C}\frac{14}{12} = 0.6823$

The last layer for the module 1 increase the RICH statistics by 37%, the whole alignment by the **347%***.







Only requested that RICH_PID = 321 and $n_\gamma \neq 0$

*Still conservative, with no quality parameter it may increase

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COMPARISON
Post / Pre:        4.467465
Variation (%):     346.746540
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RUN GROUP C

Different targets available:

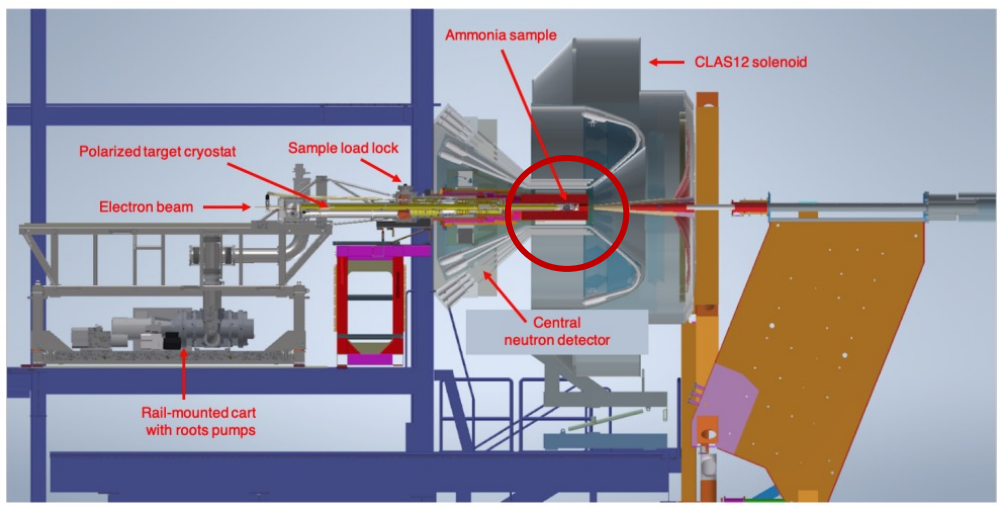
$$ET, C, CH_2, CD_2, NH_3, ND_3, He.$$

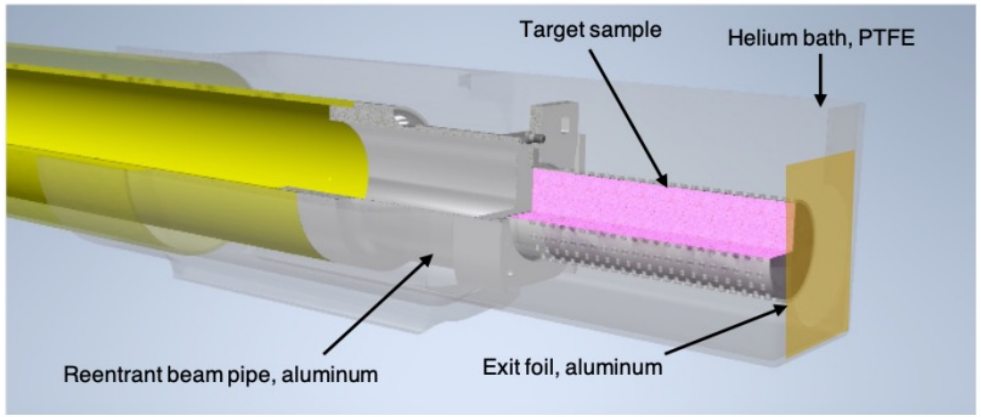
NH_3, ND_3 crystals cooled to $\sim 1\ K$ in a $5\ T$ field, free electrons become nearly fully polarized.

Microwaves ($\sim 140\ GHz$) transfer polarization from e^- to nuclei via Dynamic Nuclear Polarization (**DNP**).

Resulting polarization: **~85%** (p) & **~25%** (d).

Run Period	Solenoid	Torus
Summer 2022	Negative	Inbending
Fall 2022	Negative/Positive	Inbending
Spring 2023	Negative	In/Outbending





By: «First Use of a Longitudinally Polarized Target with CLAS12» – C. Keith et. al.

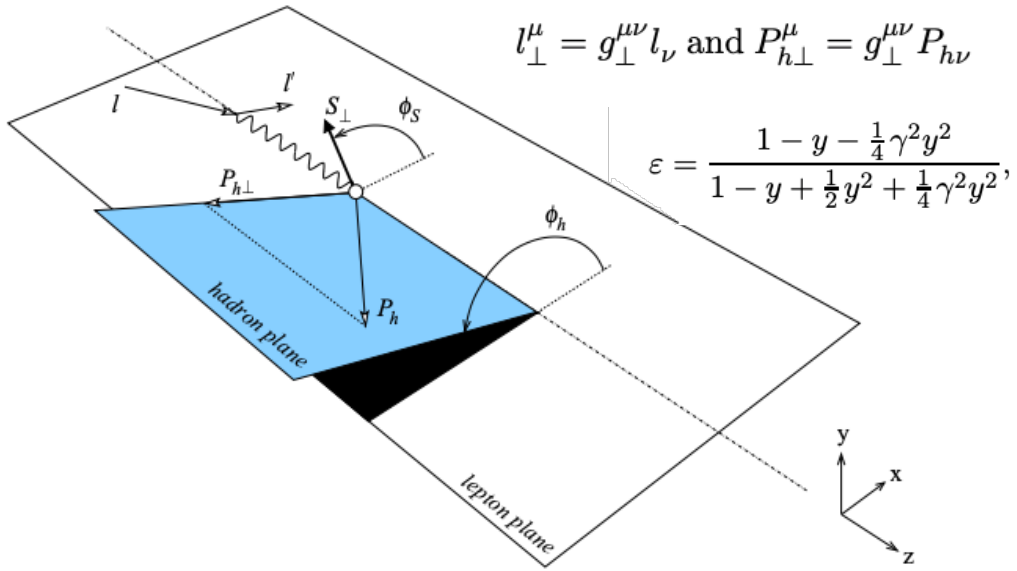
SIDIS CROSS-SECTION

$$\ell(l) + N(P) \to \ell(l') + h(P_h) + X,$$

$$q = l - l'$$

$$Q^2 = -q^2$$

$$x = \frac{Q^2}{2\,P\cdot q}, \qquad y = \frac{P\cdot q}{P\cdot l}, \qquad z = \frac{P\cdot P_h}{P\cdot q}, \qquad \gamma = \frac{2Mx}{Q}.$$



$$l_\perp^\mu = g_\perp^{\mu\nu} l_\nu \text{ and } P_{h\perp}^\mu = g_\perp^{\mu\nu} P_{h\nu}$$

$$\varepsilon = \frac{1 - y - \frac{1}{4}\gamma^2 y^2}{1 - y + \frac{1}{2}y^2 + \frac{1}{4}\gamma^2 y^2},$$

$$\begin{aligned}
\frac{d\sigma}{dx\,dy\,d\psi\,dz\,d\phi_h\,dP_{h\perp}^2} = {} & \\
& \frac{\alpha^2}{xyQ^2}\,\frac{y^2}{2\,(1-\varepsilon)}\left(1+\frac{\gamma^2}{2x}\right)\Big\{F_{UU,T} + \varepsilon F_{UU,L} + \sqrt{2\,\varepsilon(1+\varepsilon)}\,\cos\phi_h\,F_{UU}^{\cos\phi_h} \\
& + \varepsilon\cos(2\phi_h)\,F_{UU}^{\cos 2\phi_h} + \lambda_e\sqrt{2\,\varepsilon(1-\varepsilon)}\,\sin\phi_h\,F_{LU}^{\sin\phi_h} \\
& + S_\parallel\Big[\sqrt{2\,\varepsilon(1+\varepsilon)}\,\sin\phi_h\,F_{UL}^{\sin\phi_h} + \varepsilon\sin(2\phi_h)\,F_{UL}^{\sin 2\phi_h}\Big] \\
& + S_\parallel\lambda_e\Big[\sqrt{1-\varepsilon^2}\,F_{LL} + \sqrt{2\,\varepsilon(1-\varepsilon)}\,\cos\phi_h\,F_{LL}^{\cos\phi_h}\Big] \\
& + |\boldsymbol{S}_\perp|\Big[\sin(\phi_h-\phi_S)\left(F_{UT,T}^{\sin(\phi_h-\phi_S)} + \varepsilon\,F_{UT,L}^{\sin(\phi_h-\phi_S)}\right) \\
& \quad + \varepsilon\,\sin(\phi_h+\phi_S)\,F_{UT}^{\sin(\phi_h+\phi_S)} + \varepsilon\,\sin(3\phi_h-\phi_S)\,F_{UT}^{\sin(3\phi_h-\phi_S)} \\
& \quad + \sqrt{2\,\varepsilon(1+\varepsilon)}\,\sin\phi_S\,F_{UT}^{\sin\phi_S} + \sqrt{2\,\varepsilon(1+\varepsilon)}\,\sin(2\phi_h-\phi_S)\,F_{UT}^{\sin(2\phi_h-\phi_S)}\Big] \\
& + |\boldsymbol{S}_\perp|\lambda_e\Big[\sqrt{1-\varepsilon^2}\,\cos(\phi_h-\phi_S)\,F_{LT}^{\cos(\phi_h-\phi_S)} + \sqrt{2\,\varepsilon(1-\varepsilon)}\,\cos\phi_S\,F_{LT}^{\cos\phi_S} \\
& \quad + \sqrt{2\,\varepsilon(1-\varepsilon)}\,\cos(2\phi_h-\phi_S)\,F_{LT}^{\cos(2\phi_h-\phi_S)}\Big]\Big\},
\end{aligned} \tag{2.7}$$

Sub-leading Comparison with other RG.

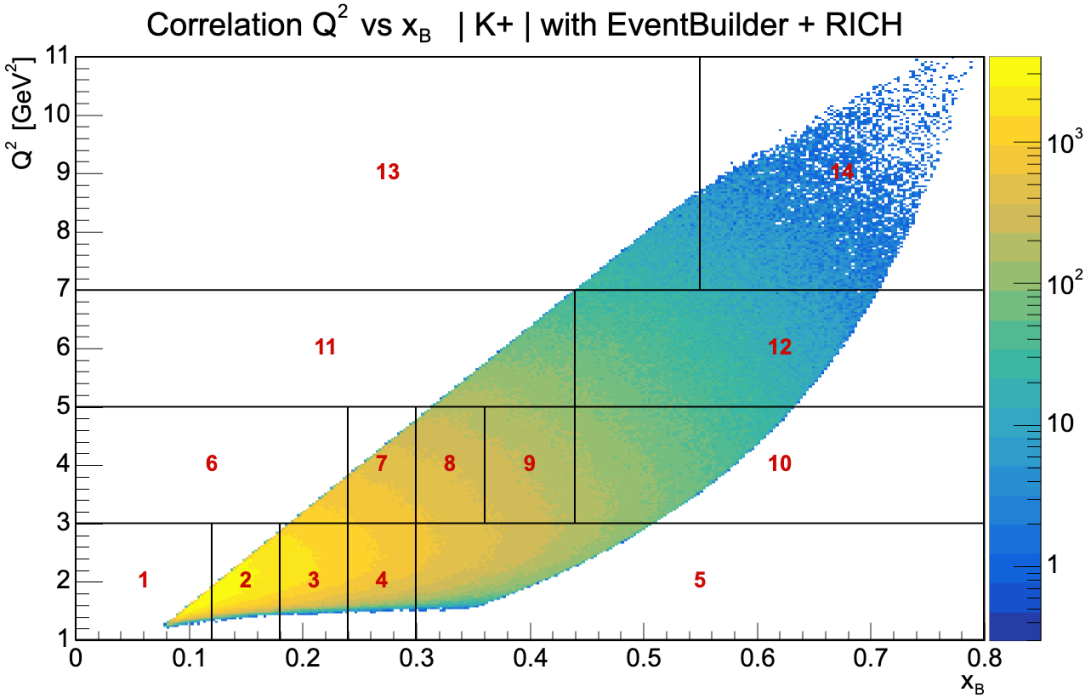
LO and Sub-LO spin-orbit correlation.

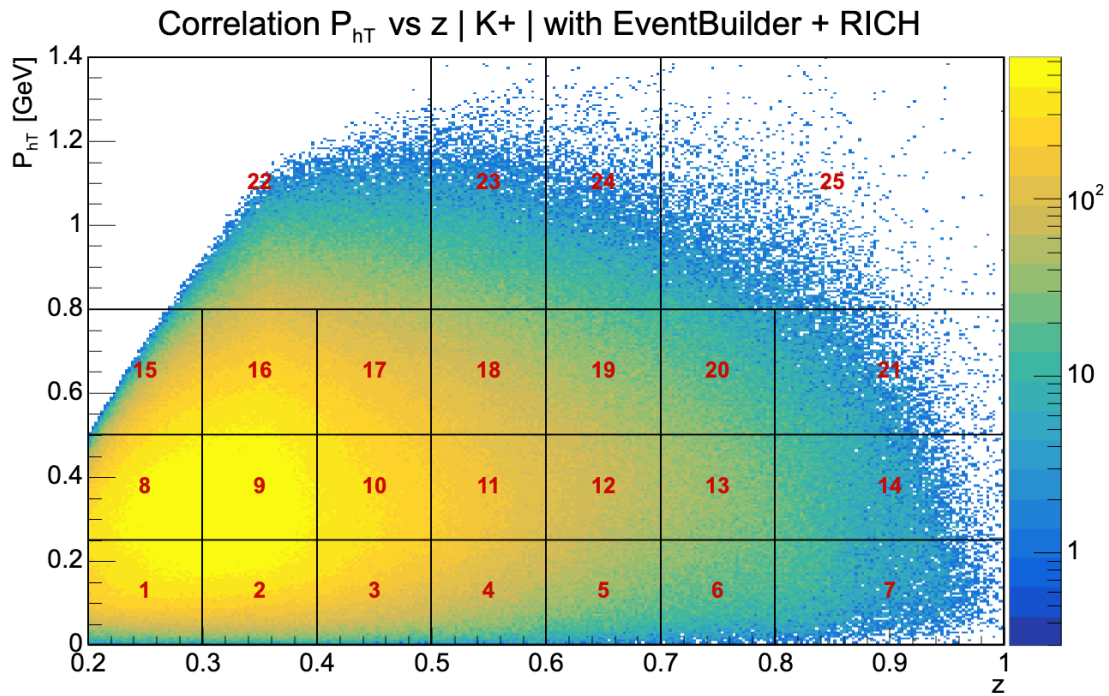
Helicity g_{1L} (LO) and Sub-LO. Transverse sensibility.

Bacchetta: arXiv:hep-ph/0611265

KINEMATIC BIN COVERAGE

RGC at **CLAS12** will access **multi-dimensional SIDIS** measurement in **unexplored kinematic region** of $\boldsymbol{x_B, Q^2, z, P_{hT}}$. From here we can obtain a $2D$ (and $4D$) extraction.





DILUTION FACTOR

FROM:
https://clasweb.jlab.org/wiki/images/7/72/Dilution_Factor_Determination_for_RG_C_10-16-26.pdf

$PF = Packing\ Fraction$
$A, B, C, D = Geometric\ coeff.$

The **Dilution Factor** was calculated as a function of x_B and later in all my kinematic bins.

D_F extracted for the eK^+X channel.

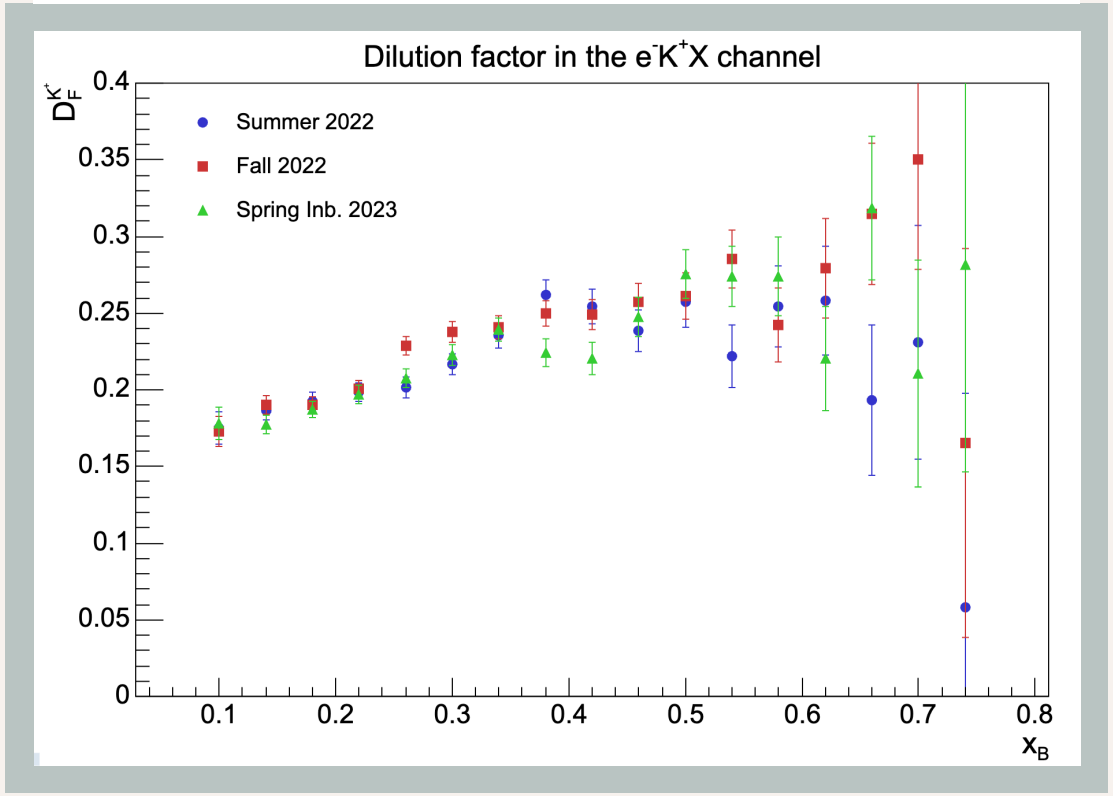
$$DF\left(PF, x, Q^2\right) = \frac{PF}{Gn_A}\left(n_{CH} + An_C + Bn_{MT} + Cn_F\right)$$

Running period	Packing fraction
Summer 2022	0.5364 ± 0.0003
Fall 2022	0.5048 ± 0.0003
Spring 2023	0.5152 ± 0.0003

RGC packing fraction available on the wiki.

Period	C	CH_2	MT	F
Summer22	16290–16293, 16296, 16297, 16700–16702, 16704	16298–16300, 16302, 16303	16309	16194
Fall22	17138–17140, 17170	17132–17135	16975	16872
Spring23	17566, 17567, 17569, 17744–17746	17625–17627, 17635, 17637, 17638	17766–17768	17763–17765

RGC runs used for the D_F extrapolation
All the good NH_3 runs where used.



ASYMMETRY EXTRACTION

The unbinned Maximum Likelihood Estimation uses the function:

$$f_i(\phi_h) = 1 + A_{UU}(\phi_{h,i}) + h_{b,i}P_b A_{LU}(\phi_{h,i}) + h_{t,i}P_{t,i}D_f[A_{UL}(\phi_{h,i}) + h_{b,i}P_{b,i}A_{LL}(\phi_{h,i})]$$

$$A_{LU} = \frac{W(\varepsilon,y)}{A(\varepsilon,y)}\frac{F_{LU}^{sin\phi}}{F_{UU}}sin\phi$$

$$A_{UL} = \frac{V(\varepsilon,y)}{A(\varepsilon,y)}\frac{F_{UL}^{sin\phi}}{F_{UU}}sin\phi + \frac{B(\varepsilon,y)}{A(\varepsilon,y)}\frac{F_{UL}^{sin2\phi}}{F_{UU}}sin2\phi$$

$$A_{LL} = \frac{C(\varepsilon,y)}{A(\varepsilon,y)}\frac{F_{LL}}{F_{UU}} + \frac{W(\varepsilon,y)}{A(\varepsilon,y)}\frac{F_{LL}^{cos\phi}}{F_{UU}}cos\phi$$

$$A_{UU} = \frac{V(\varepsilon,y)}{A(\varepsilon,y)}\frac{F_{UU}^{cos\phi}}{F_{UU}}cos\phi + \frac{B(\varepsilon,y)}{A(\varepsilon,y)}\frac{F_{UU}^{cos2\phi}}{F_{UU}}cos2\phi$$

To correct imbalance in the target/beam accumulated charge, we could introduce four weights as:

$$m_b = \min\left[\left(C_{FC}^{++} + C_{FC}^{+-}\right), \left(C_{FC}^{-+} + C_{FC}^{--}\right)\right] \qquad w^{++} = \frac{m_b m_t}{(C_{FC}^{++} + C_{FC}^{+-})(C_{FC}^{++} + C_{FC}^{-+})}, \quad w^{-+} = \frac{m_b m_t}{(C_{FC}^{-+} + C_{FC}^{--})(C_{FC}^{++} + C_{FC}^{-+})},$$

$$m_t = \min\left[\left(C_{FC}^{++} + C_{FC}^{-+}\right), \left(C_{FC}^{+-} + C_{FC}^{--}\right)\right] \qquad w^{+-} = \frac{m_b m_t}{(C_{FC}^{++} + C_{FC}^{+-})(C_{FC}^{+-} + C_{FC}^{--})}, \quad w^{--} = \frac{m_b m_t}{(C_{FC}^{-+} + C_{FC}^{--})(C_{FC}^{+-} + C_{FC}^{--})}.$$

Final likelihood:

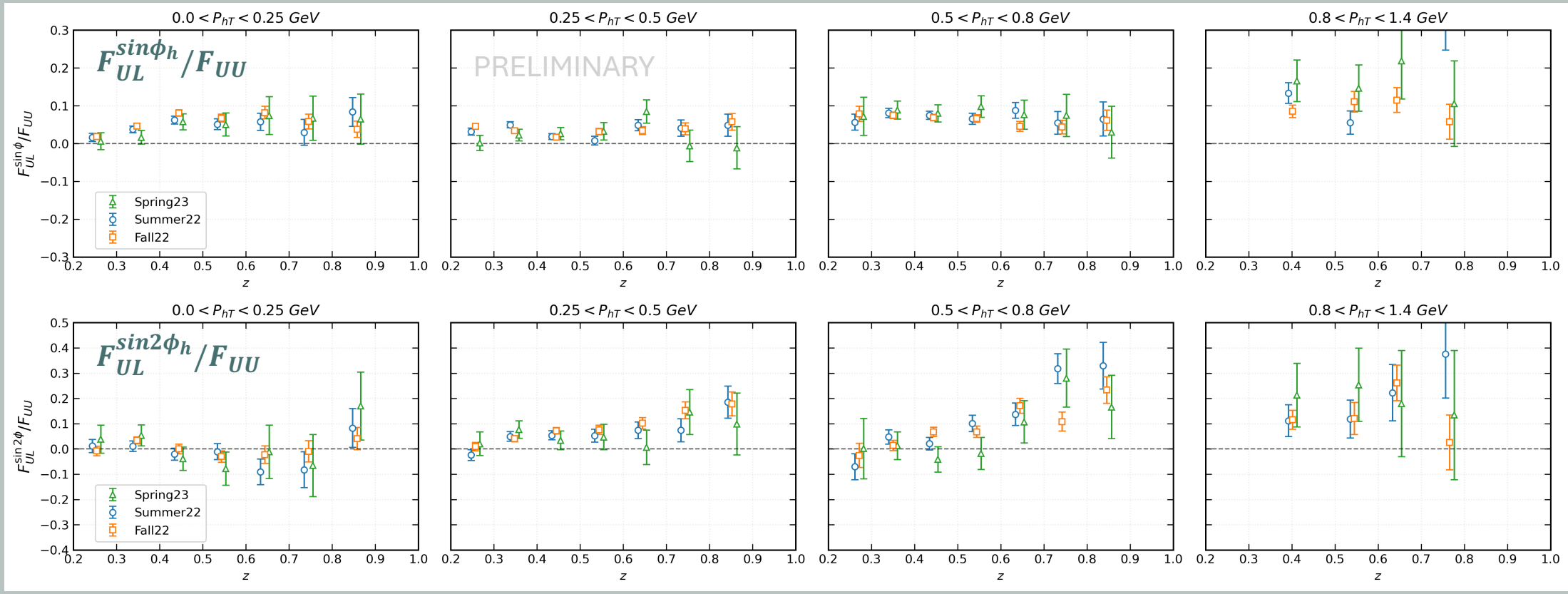
$$\mathcal{N}_{UU}(\boldsymbol{\mathcal{A}}) = \frac{1}{M_0}\sum_{j=1}^{N_{\mathrm{MC}}} q_j \left[1 + \frac{V_j}{A_j}A_{UU}^{\cos\phi_h}\cos\phi_{h,j} + \frac{B_j}{A_j}A_{UU}^{\cos 2\phi_h}\cos(2\phi_{h,j})\right],$$

$$\boldsymbol{-log\mathcal{L} = Nlog\mathcal{N}_{UU}(A) - \sum_i w^{bt}\log[f_i(\phi_{h,i})]}$$

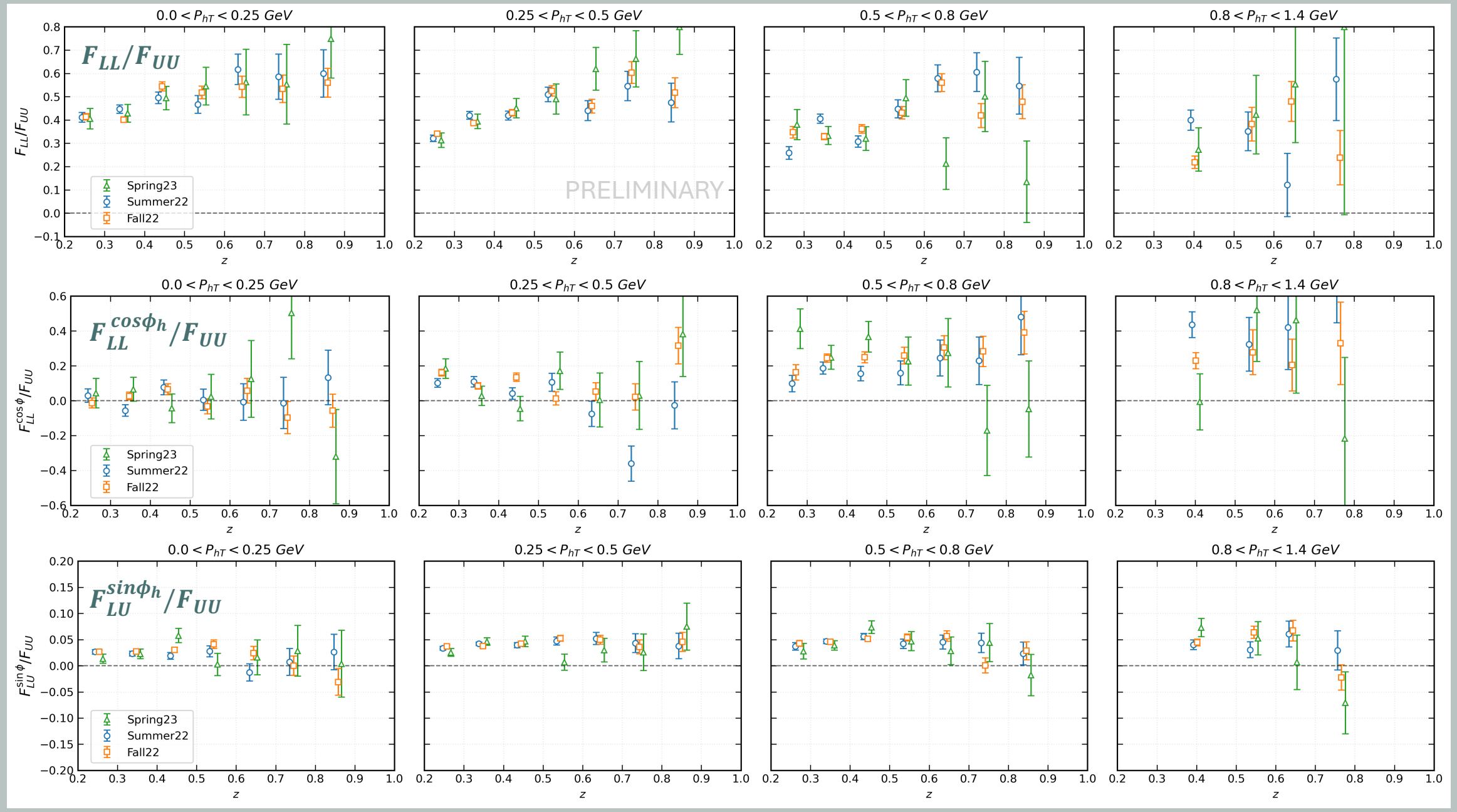
From Timothy:
https://clas12-docdb.jlab.org/DocDB/0011/001176/001/CLAS_MLM_Analysis_Note.pdf

COMPARISON IN NH3 – zP_{hT}

Example of $F_{UL}^{sin\phi_h}/F_{UU}$ and $F_{UL}^{sin2\phi_h}/F_{UU}$ as a function of z & P_{hT} for the three campaigns.



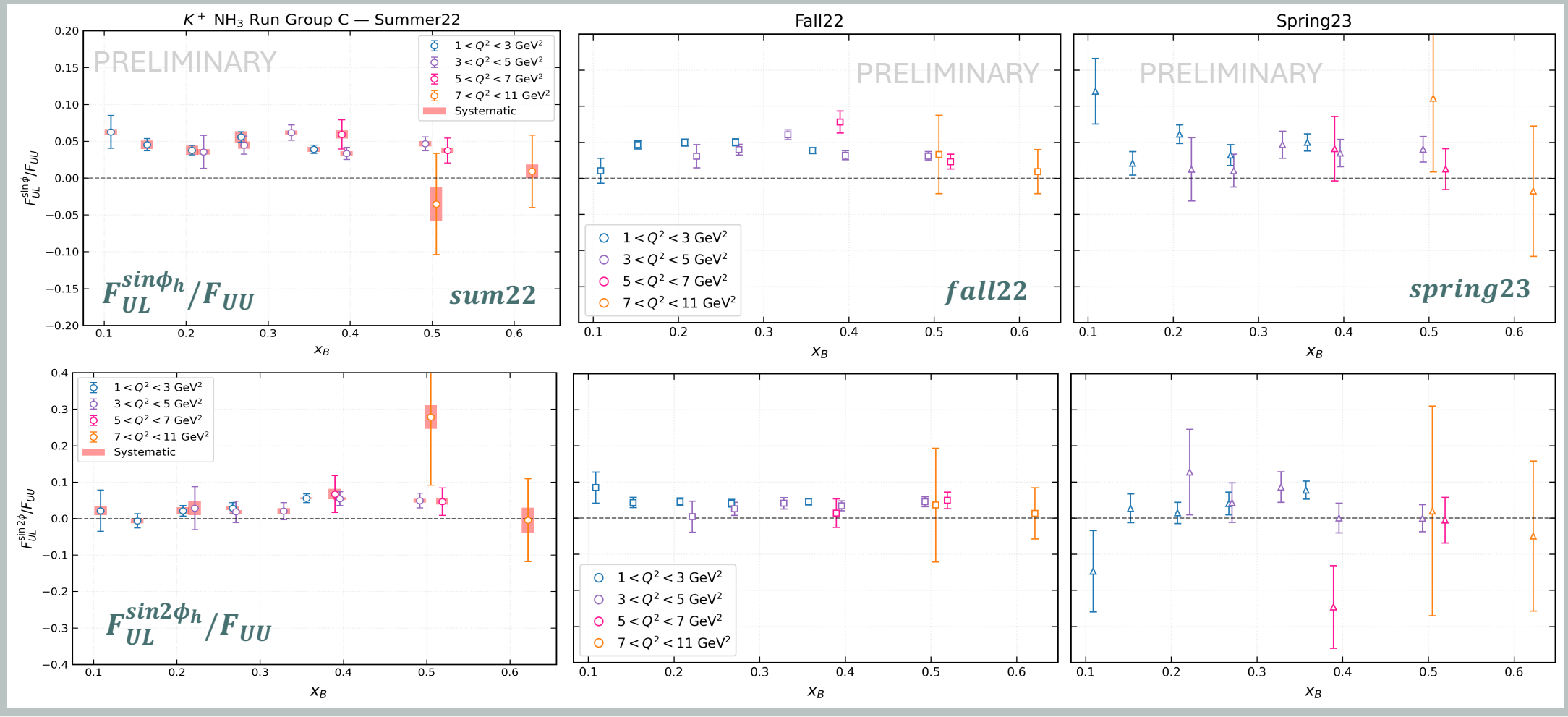
A BIAS ON THE Z AXIS IS PERFORMED TO HIGHLIGHT EACH CAMPAIGN RESULTS.

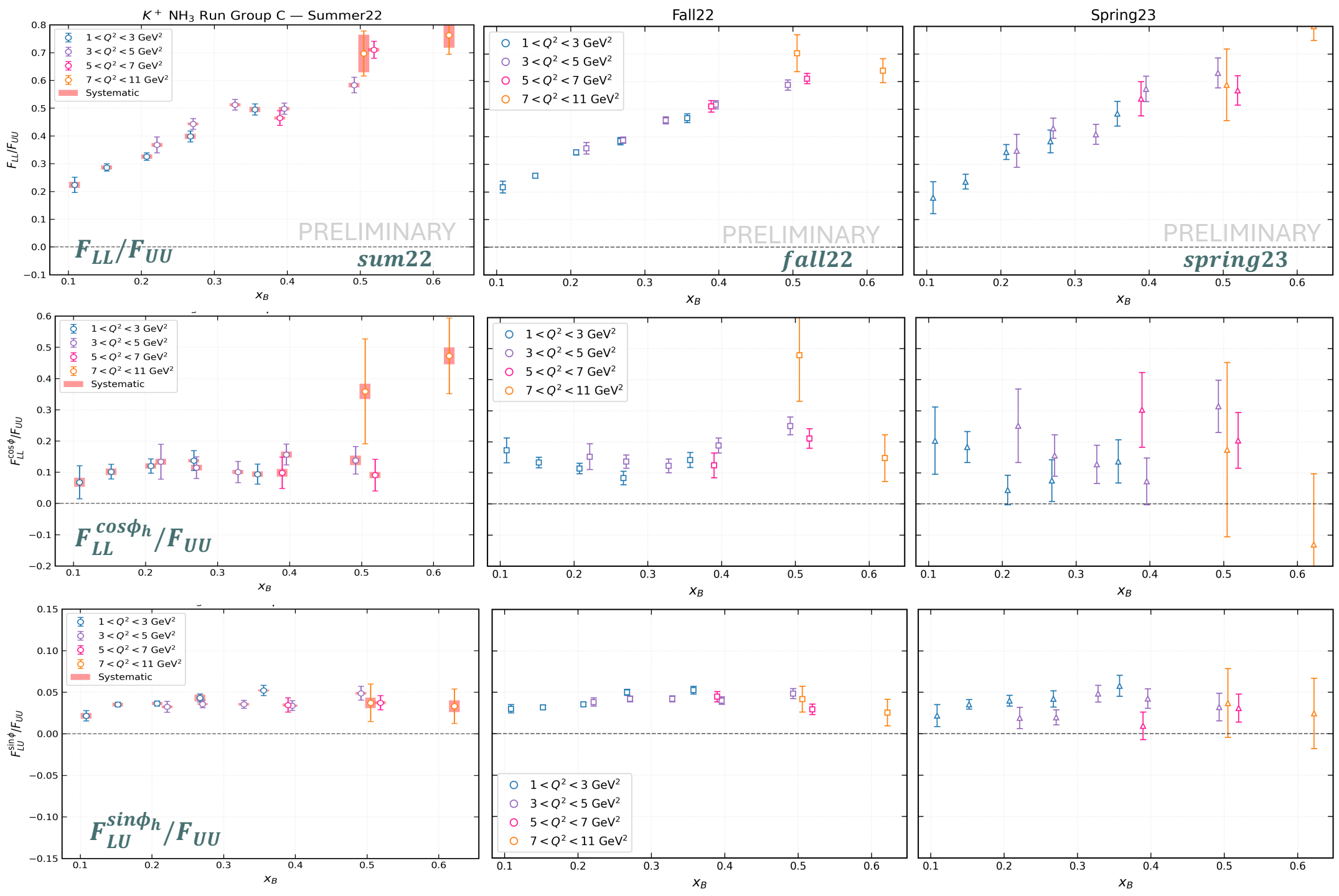


A BIAS ON THE Z AXIS IS PERFORMED TO HIGHLIGHT EACH CAMPAIGN RESULTS.

COMPARISON IN NH3 – $x_B Q^2$

Example of $F_{UL}^{sin\phi_h}/F_{UU}$ and $F_{UL}^{sin2\phi_h}/F_{UU}$ as a function of x_B & Q^2 for the **three** campaigns.




K^+ NH_3 Run Group C — Summer22
Fall22
Spring23
$1 < Q^2 < 3$ GeV^2
$3 < Q^2 < 5$ GeV^2
$5 < Q^2 < 7$ GeV^2
$7 < Q^2 < 11$ GeV^2
Systematic
PRELIMINARY
F_{LL}/F_{UU}
sum22
fall22
spring23
$F_{LL}^{\cos\phi_h}/F_{UU}$
$F_{LU}^{\sin\phi_h}/F_{UU}$
x_B

CONCLUSIONS & OUTLOOK

Conclusions:

- Good **agreement** has been observed between the **Summer22, Fall22 and Spring23** campaigns.
- **Single-** and **double-spin asymmetries** have been successfully extracted in **two-dimensional kinematic bins** (time to move on the $4D$ measurements).
- A first evaluation of **systematic uncertainties** has been performed using **Monte Carlo samples** for the **Summer22** and **Fall22** campaign, showing good preliminary results and possible impacts.

Next steps:

- Include the future **RICH alignment** corrections in the analysis framework (soon).
- Continue the evaluation and refinement of the **systematic uncertainties** (different kinematic dependence, more statistics, consider other systematics).
- Extend the analyses to $\boldsymbol{K^-}$ (approximately soon) and the $\boldsymbol{ND_3}$ **target** (future).
- **Multiplicity** results started to be extracted but need a dedicated study.

THANKS

SYSTEMATICS

(WORK IN PROGRESS)

RGC SYSTEMATICS

MC Dataset: Nilanga's MC productions on OSG of the **summer22** and **fall22** campaigns.

Location: /volatile/clas12/osg/nwickjlb/ or /work/clas12b/users/nwickjlb/osg_output/rg-c/

Generated a total of **100** M event per run period.

Since the asymmetries are estimated with a MLE, and the MC is unpolarized, I injected the asymmetries with a similar function:

$$f_i(\phi_h) = 1 + P_b h_{b,i} A_{LU}^{inj}(\phi_{h,i}) + D_t P_{t,i}\,[A_{UL}^{inj}(\phi_{h,i}) + P_b h_{b,i} A_{LL}^{inj}(\phi_{h,i})]$$

Fixed starting parameters: $\frac{F_{UL}^{sin\phi}}{F_{UU}} = \frac{F_{UL}^{sin2\phi}}{F_{UU}} = \frac{F_{LL}^{cos\phi}}{F_{UU}} = 0.10.$ $\frac{F_{LL}}{F_{UU}} = 0.40$ $\frac{F_{LU}^{sin\phi}}{F_{UU}} = 0.05$

RGC SYSTEMATICS

The injected asymmetries are (x_B, Q^2, z, P_{hT}) dependent, following the TMDs theory:

$$A_{UL,inj}^{sin\phi_h} = \frac{V(\varepsilon)}{A(\varepsilon)} \frac{F_{UL}^{sin\phi_h}}{F_{UU}} [1 + c_z(z - z_0)][1 + c_{P_{hT}}(P_{hT} - P_{hT,0})] \sqrt{\frac{Q_0^2}{Q^2}} sin\phi_h$$

$$A_{UL,inj}^{sin2\phi_h} = \frac{B(\varepsilon)}{A(\varepsilon)} \frac{F_{UL}^{sin2\phi_h}}{F_{UU}} [1 + c_z(z - z_0)] \left[1 + c_{P_{hT}^2}(P_{hT}^2 - P_{hT,0}^2)\right] [1 + c_{x_B}(x_B - x_{B,0})] \sin 2\phi_h$$

$$A_{LL,inj} = \frac{C(\varepsilon)}{A(\varepsilon)} \frac{F_{LL}}{F_{UU}} [1 + c_{x_B}^B(x_B - x_{B,0})][1 + c_z^B(z - z_0)]$$

$$A_{LL,inj}^{cos\phi_h} = \frac{W(\varepsilon)}{A(\varepsilon)} \frac{F_{LL}^{cos\phi_h}}{F_{UU}} [1 + c_{x_B}(x_B - x_{B,0})][1 + c_{P_{hT}}(P_{hT} - P_{hT,0})] \sqrt{\frac{Q_0^2}{Q^2}} \cos\phi_h$$

$$A_{LU,inj}^{sin\phi_h} = \frac{W(\varepsilon)}{A(\varepsilon)} \frac{F_{LU}^{sin\phi_h}}{F_{UU}} [1 + c_z(z - z_0)][1 + c_{P_{hT}}(P_{hT} - P_{hT,0})] \sqrt{\frac{Q_0^2}{Q^2}} \sin\phi_h$$

I inject the asymmetry one time per event, and accepting or rejecting it following:

$$u = f_{max} \cdot rng.Rndm() \quad ; \quad accepted\ if\ u < f_i$$

RGC SYSTEMATICS – TOY MODEL

The asymmetries are extracted with the unbinned **Maximum Likelihood Estimation**, systematic effects are evaluated through the asymmetry difference, $\boldsymbol{\Delta A = A_{measured} - A_{expected}}$.

Used a **Toy model** which repeat the full asymmetry extraction **N** times. Each toy use a different **random seed** and assign an independent **Poisson weight** to every MC event, to modify the statistics of every toy step.

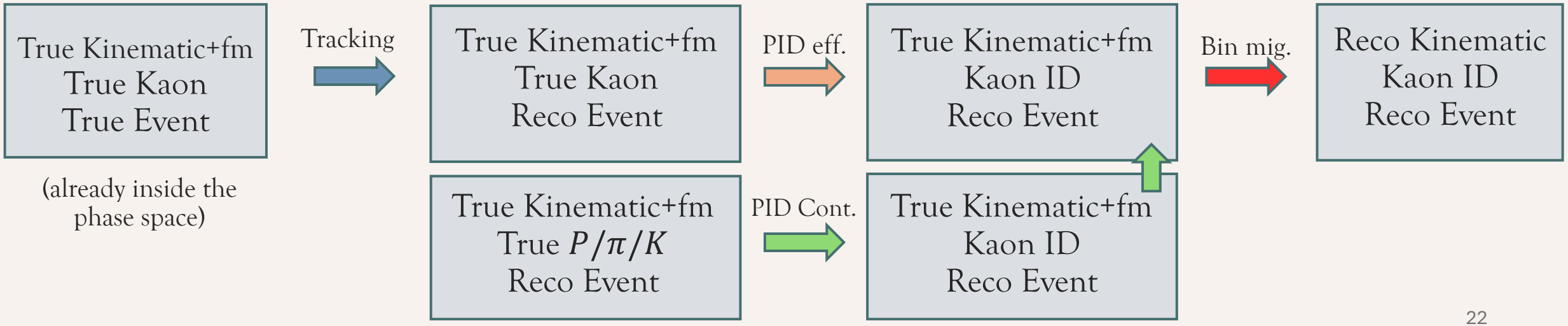
$$\Delta A = \frac{1}{N}\sum_{i=1}^{N}\Delta A_i \quad ; \quad \sigma_A = \frac{1}{\sqrt{N}}\sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(\Delta A_i - \Delta A)^2}$$

The toy ensemble allows us to **separate** a genuine **systematic bias** from the **statistical fluctuations** of the **Monte Carlo sample**.

RGC SYSTEMATICS – TOY MODEL

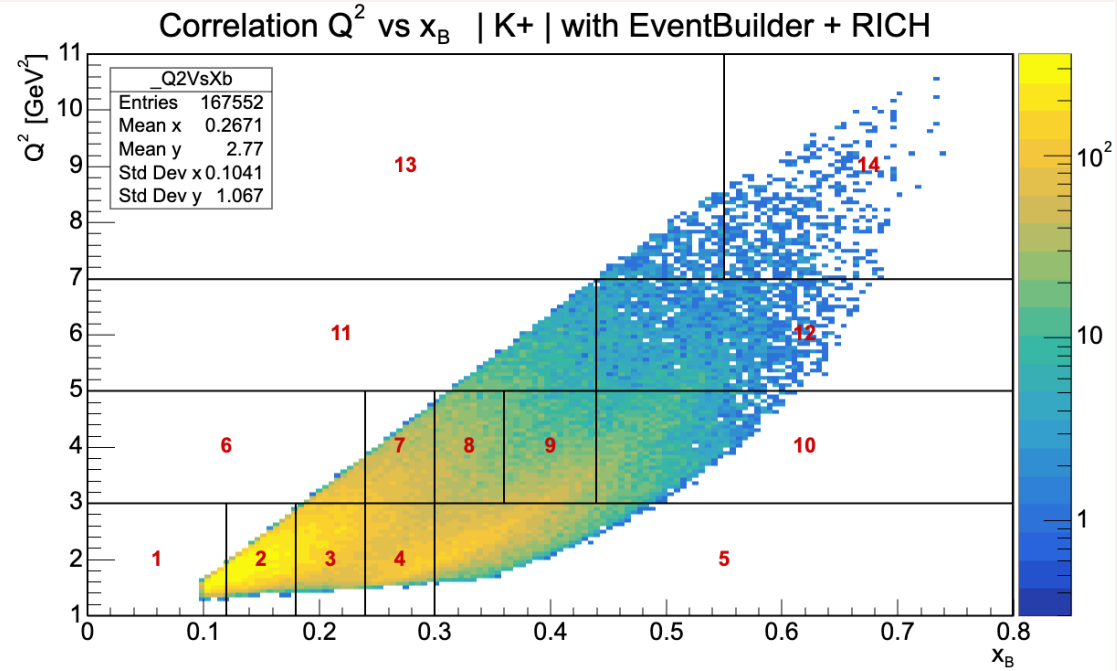
Considering the j-th systematics we can define the total systematic with quadratic sum of each contribution and its error propagation.

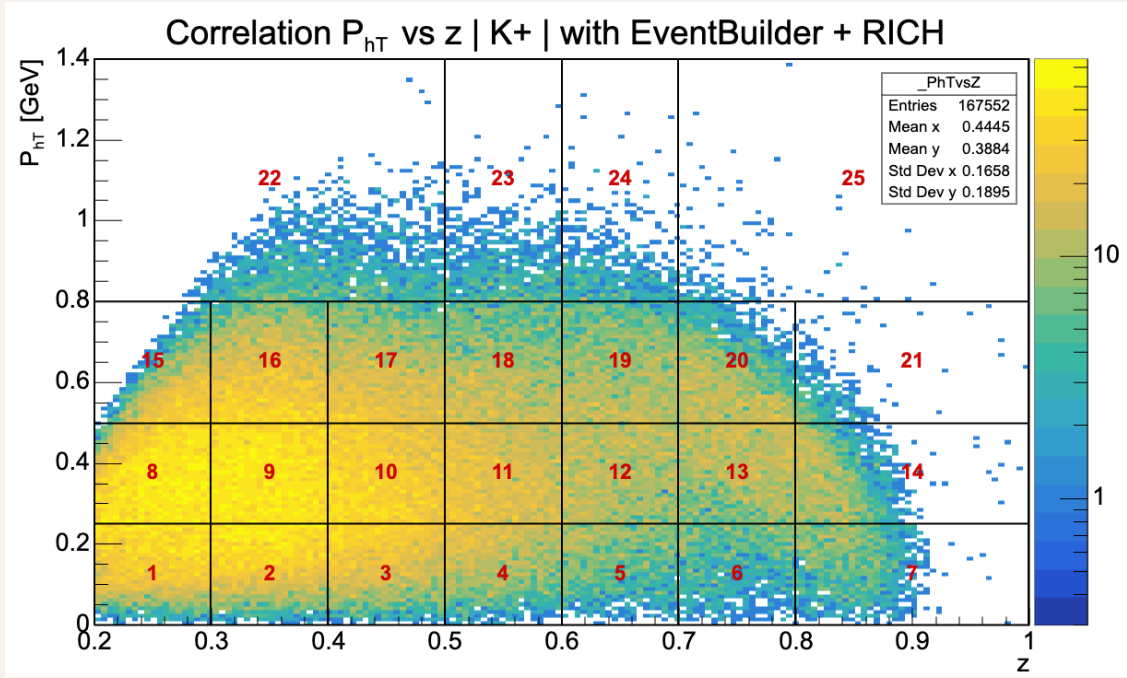
$$\Delta A^{tot} = \sqrt{\sum_j (\Delta A^j)^2} \quad \&\& \quad \sigma_A^{tot} = \sqrt{\sum_j \left(\frac{\Delta A^j}{\Delta A^{tot}}\right)^2 \sigma_{A,j}^2}$$



KINEMATIC BIN COVERAGE

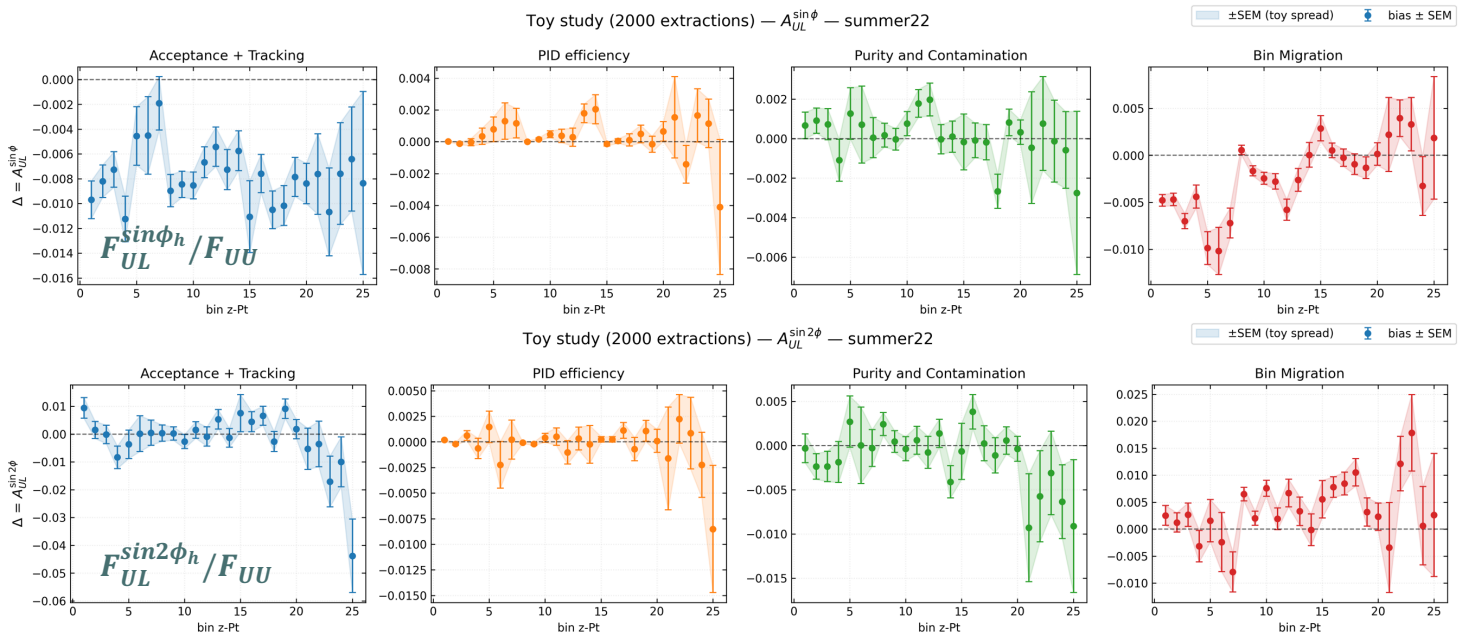
Kinematic regions of x_B, Q^2, z, P_{hT}, from which we can obtain a $2D$ extraction. Some bins of zP_{hT} show a very poor statistics, thus is difficult to consider the result reliable.





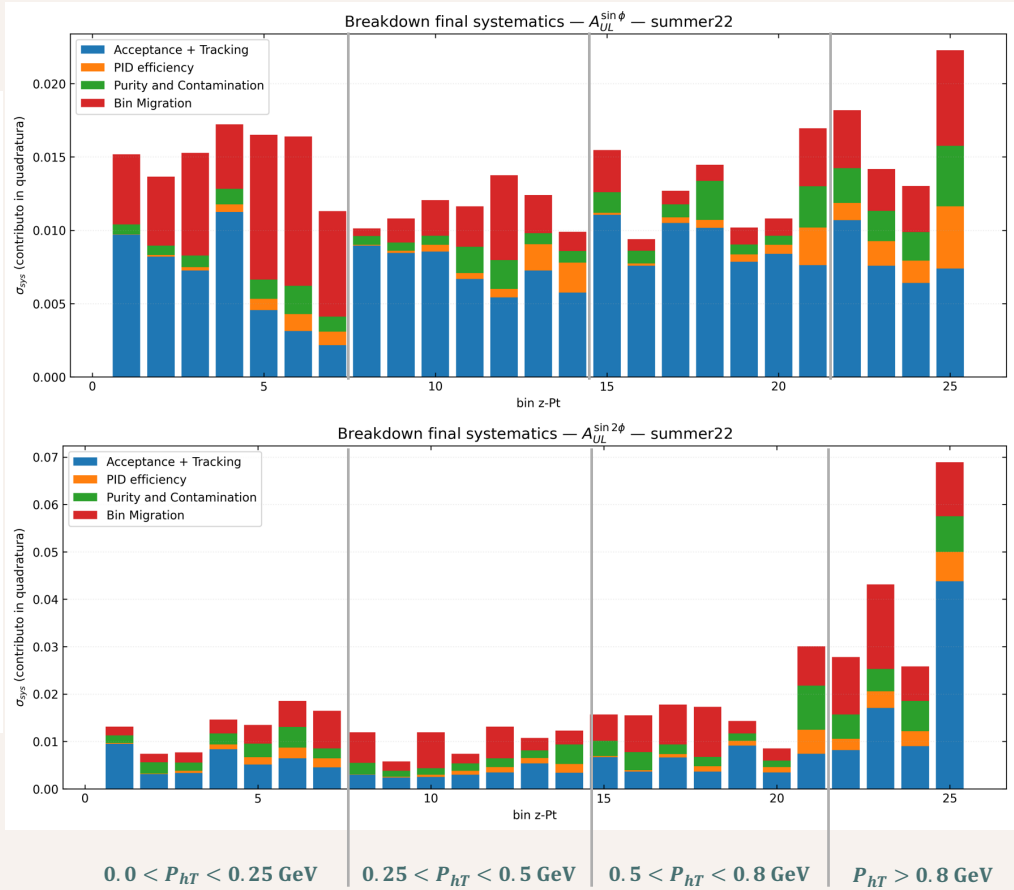
TOY MODEL – A_{UL} MODULATION (z, P_{hT})

Results from **summer** and **fall** are similar, then only **summer22** will be presented here.

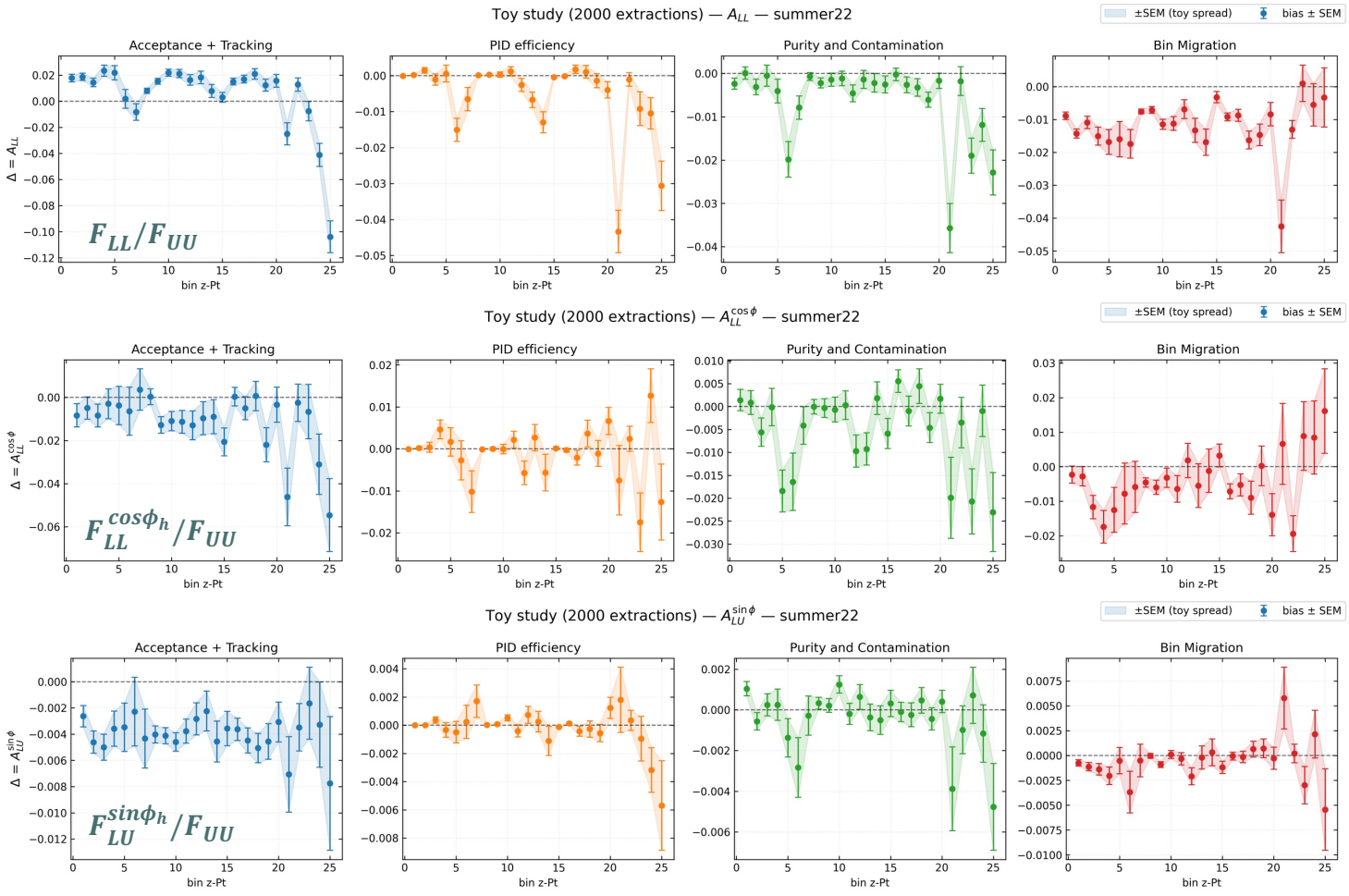


Distribution of the $\overline{\Delta A}$ after 2000 extraction for each zP_{hT} bin for the four systematics.

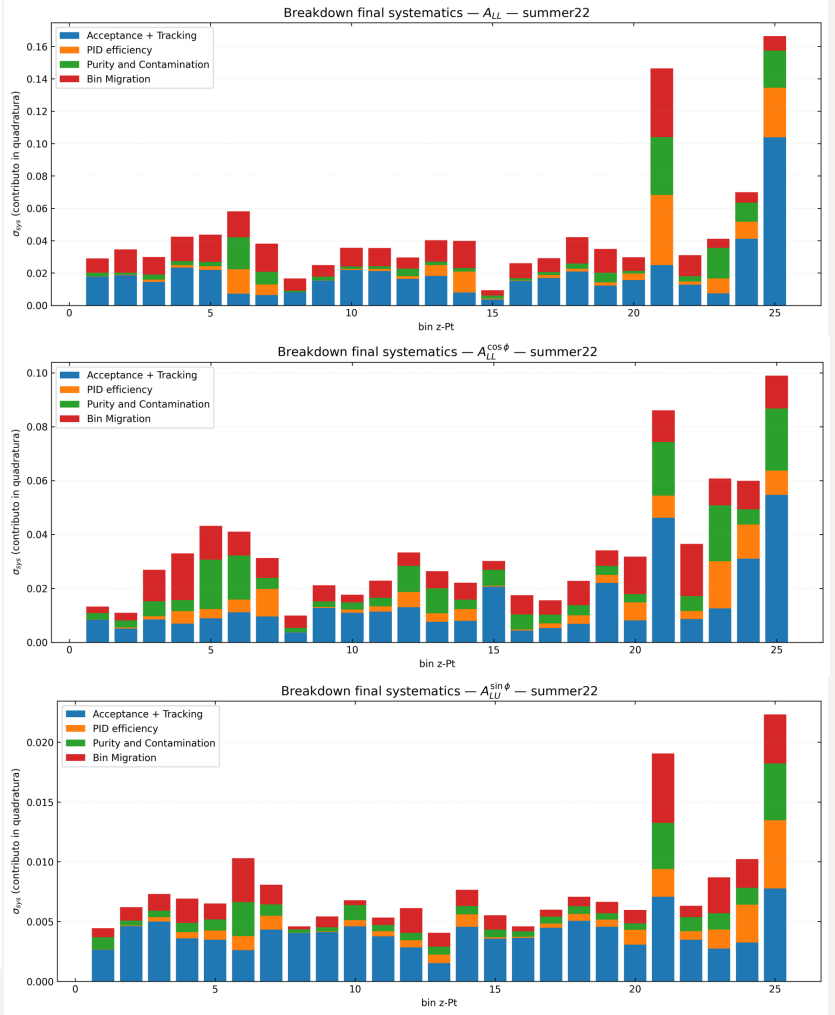
Systematic composition (**linear sum**) for each zP_{hT} bin.



TOY MODEL – A_{LL} & A_{LU} MODULATION



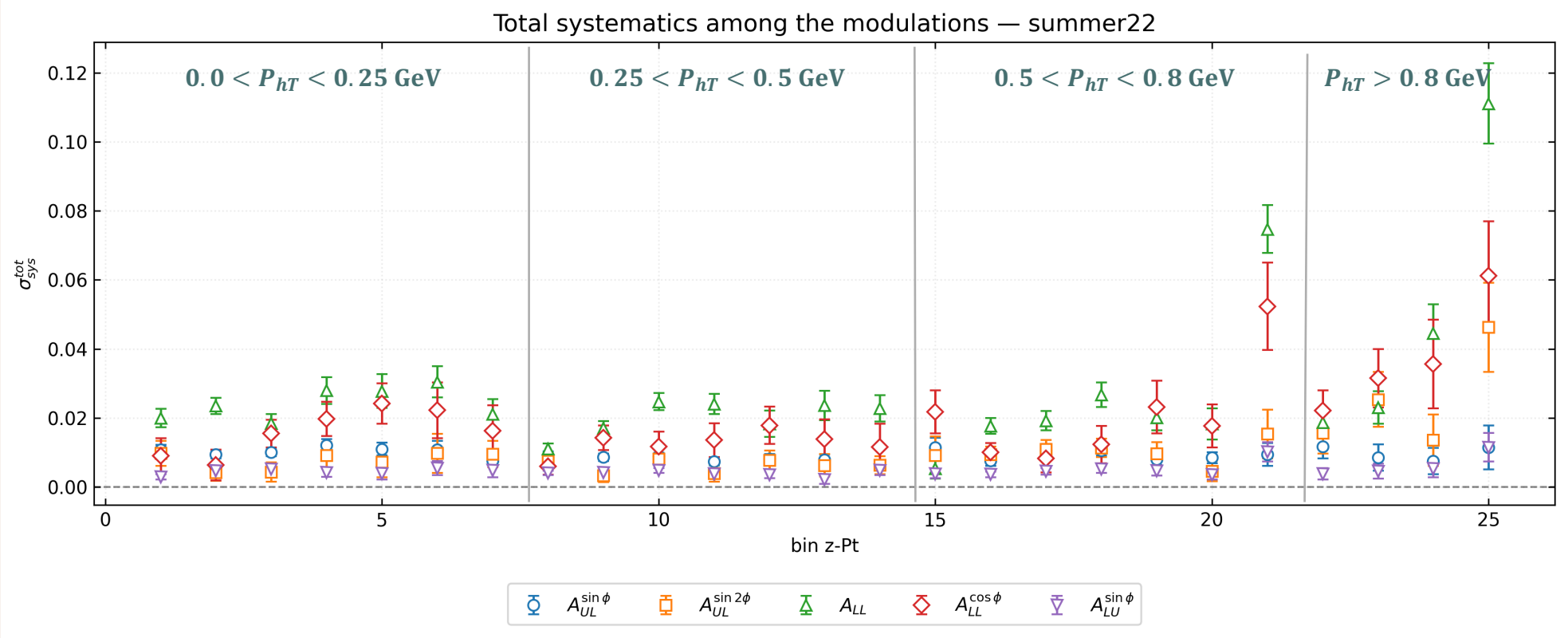
Distribution of the $\overline{\Delta A}$ after 2000 extraction, in order from the top: A_{LL}, $A_{LL}^{cos\phi}$, $A_{LU}^{sin\phi}$.



Systematic composition (linear sum) for each zP_{hT} bin.

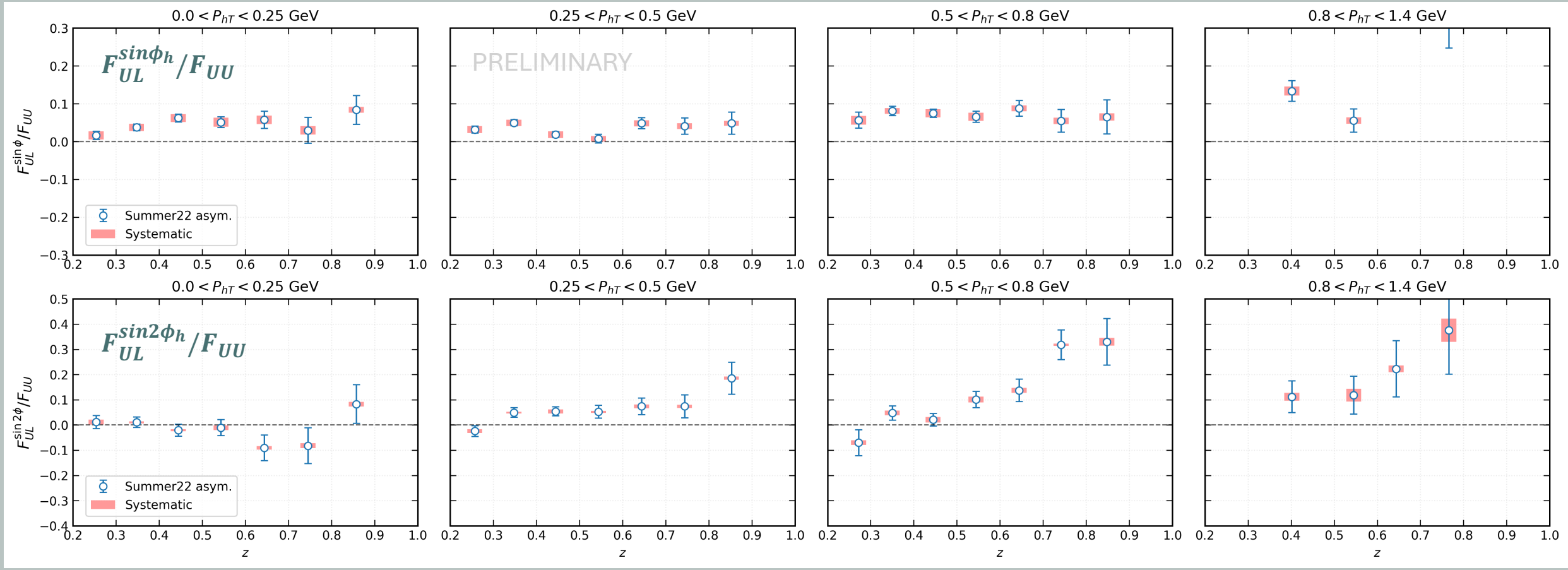
TOY MODEL – TOTAL OVERVIEW

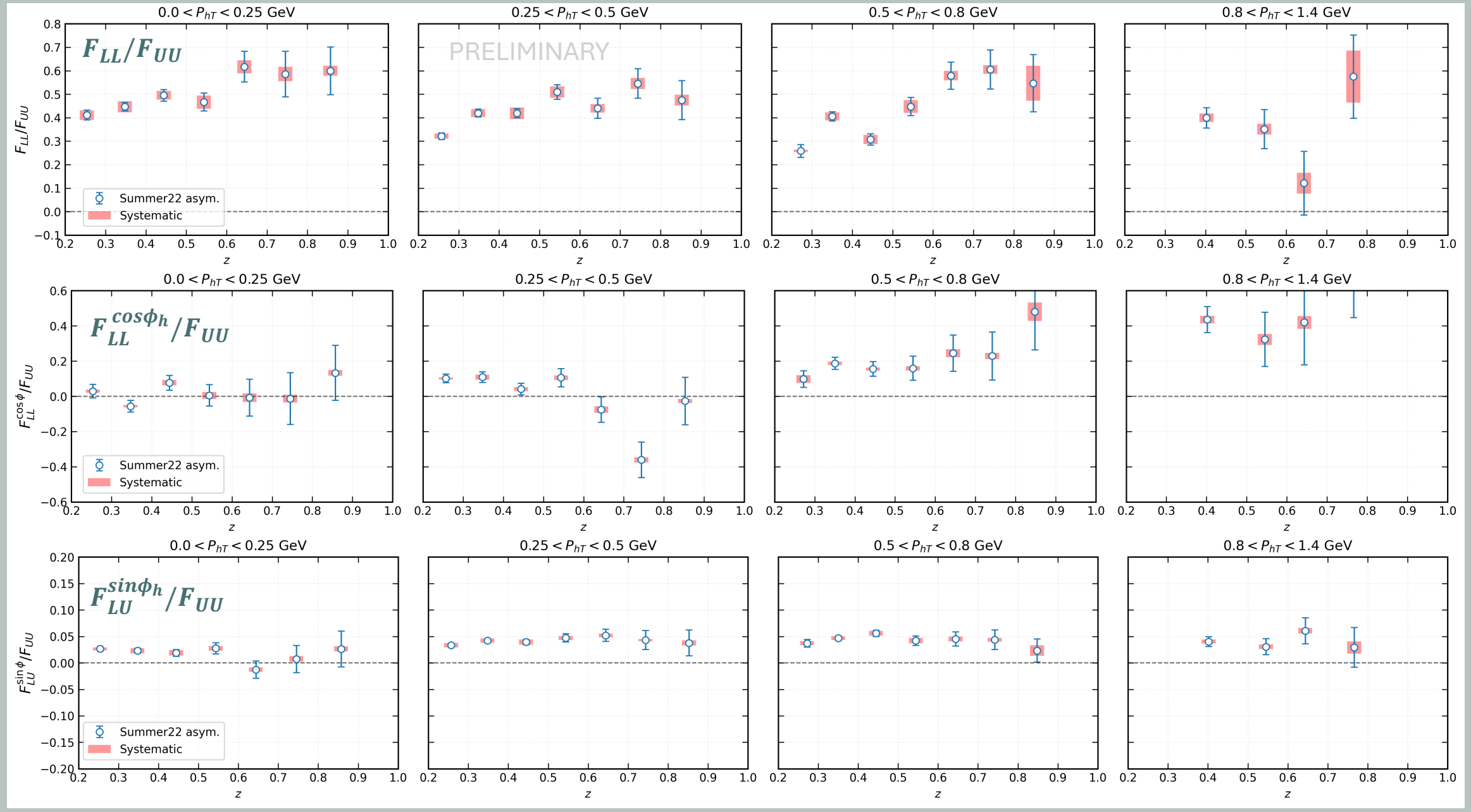
Considering the systematics as independent in first approximation, and considering only the systematics if $\frac{|bias_i|}{SEM_i} > 1.5$, under this cut I use the **SEM** as **systematics.**



SYSTEMATIC OVERVIEW

(Asymmetries + total systematic)

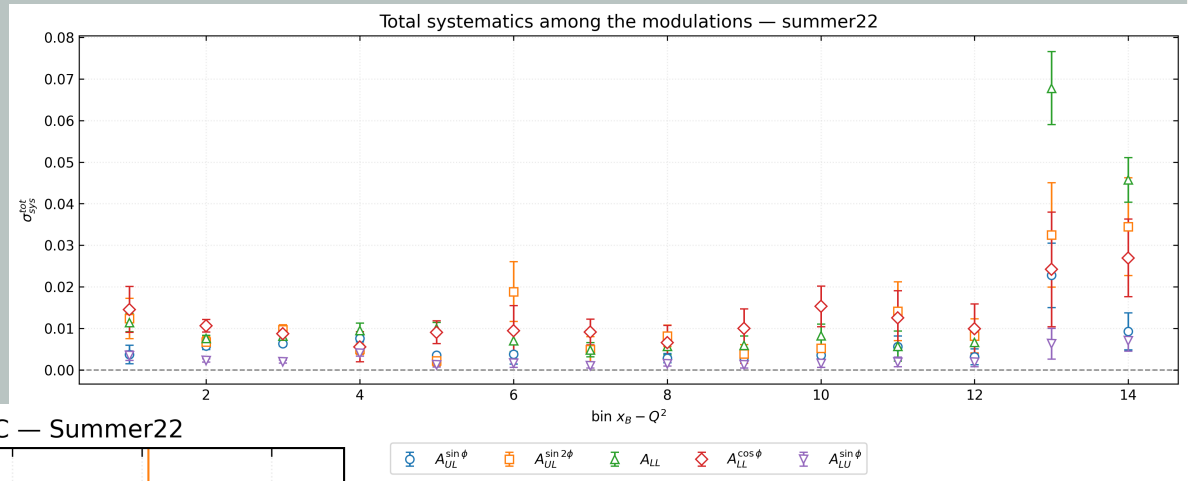


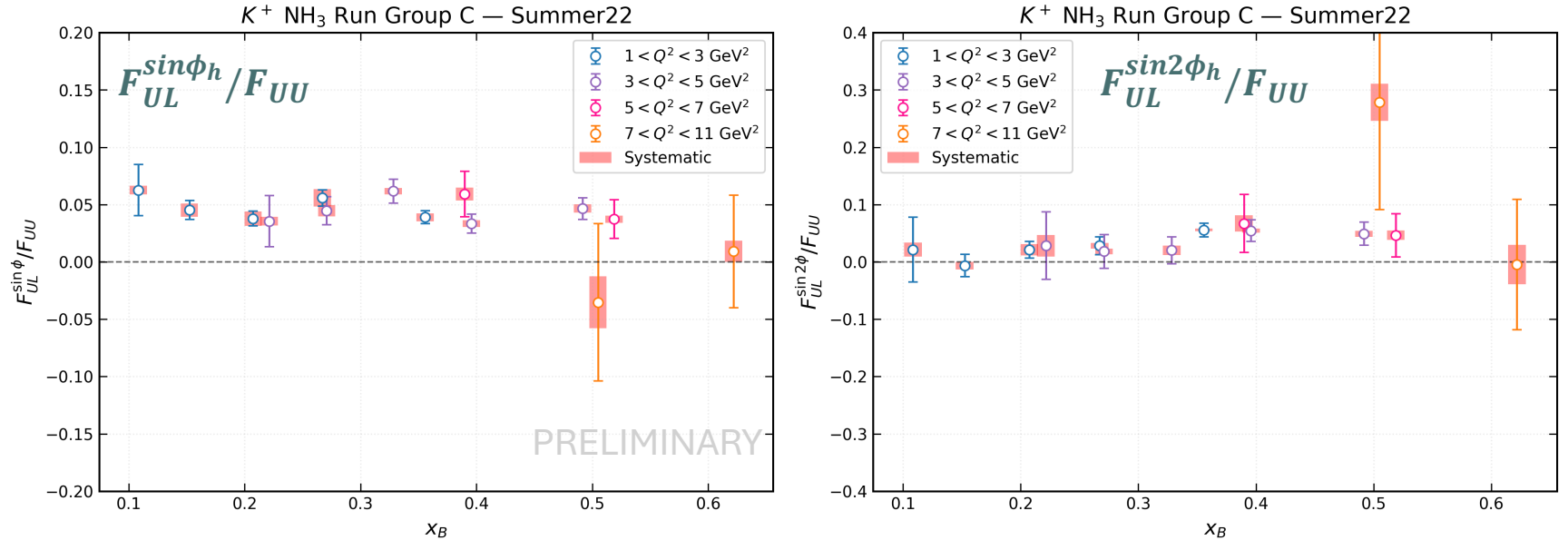

F_{LL}/F_{UU}
PRELIMINARY
$F_{LL}^{cos\phi_h}/F_{UU}$
$F_{LU}^{sin\phi_h}/F_{UU}$
$0.0 < P_{hT} < 0.25$ GeV
$0.25 < P_{hT} < 0.5$ GeV
$0.5 < P_{hT} < 0.8$ GeV
$0.8 < P_{hT} < 1.4$ GeV
Summer22 asym.
Systematic
z

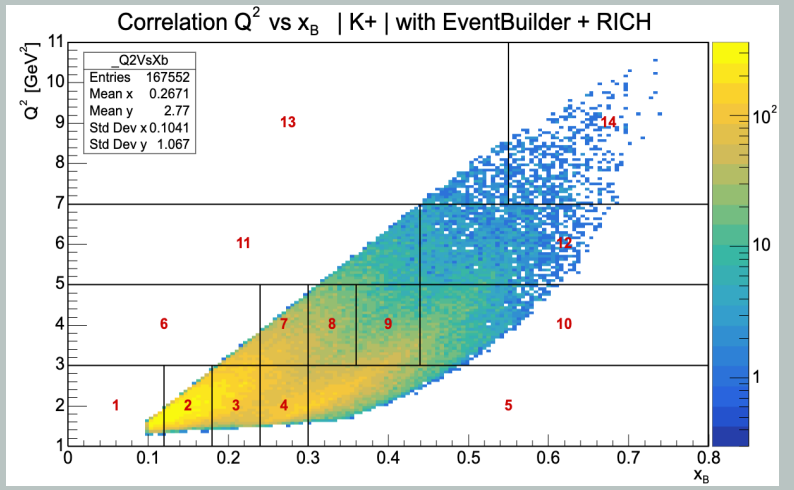
SYSTEMATIC OVERVIEW (x_B, Q^2)

Short example of x_B, Q^2 systematics are shown here.

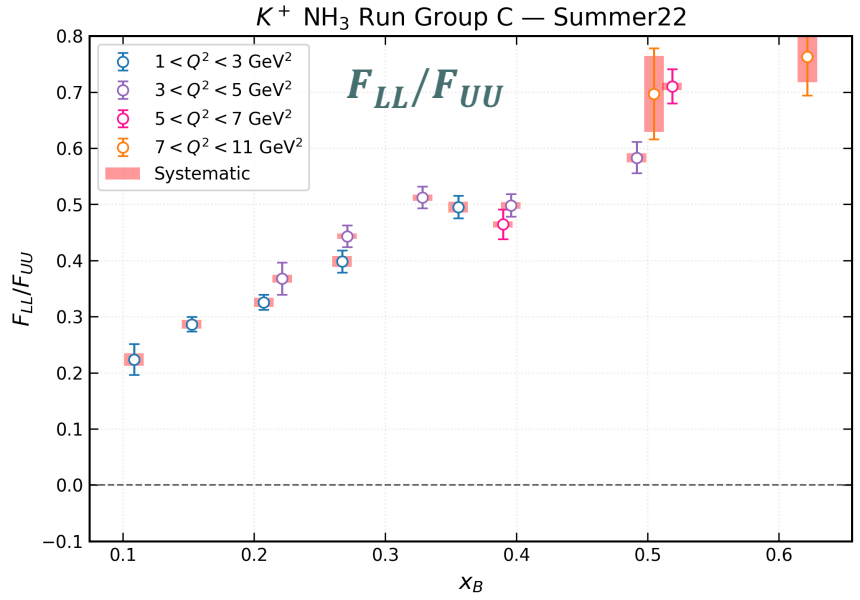
These results are from the **summer22** campaign.

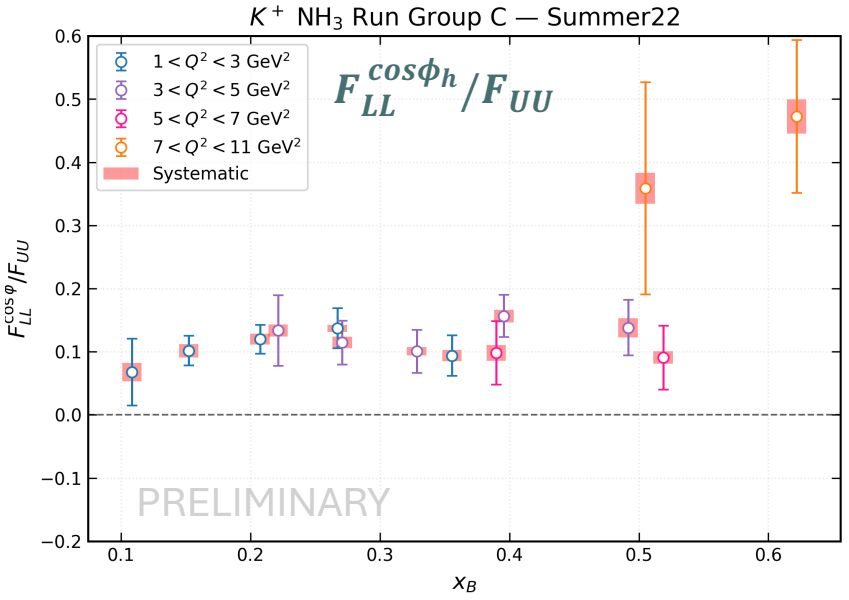


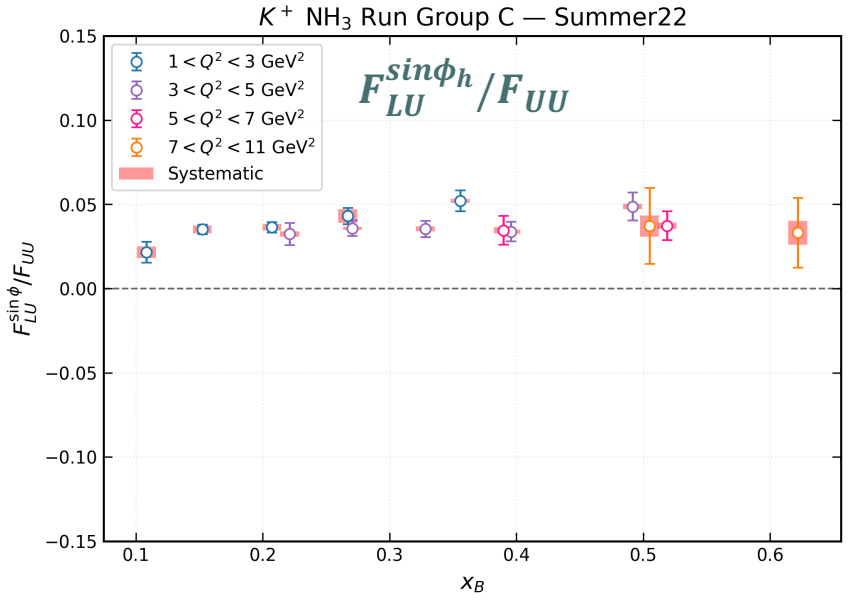




SYSTEMATIC OVERVIEW (x_B, Q^2)







Systematics and asymmetry comparisons for: A_{LL}, $A_{LL}^{cos\phi}$, $A_{LU}^{sin\phi}$.

ASYMMETRY EXTRACTION

The unbinned Maximum Likelihood Estimation uses the function:

$$F_i(\boldsymbol{\mathcal{A}}) = 1 + \frac{V_i}{A_i} A_{UU}^{\cos\phi_h} \cos\phi_{h,i} + \frac{B_i}{A_i} A_{UU}^{\cos 2\phi_h} \cos(2\phi_{h,i}) + \\ + \lambda_i P_b \frac{W_i}{A_i} A_{LU}^{\sin\phi_h} \sin\phi_{h,i} + \\ + D_F P_{T,i} \left[\frac{V_i}{A_i} A_{UL}^{\sin\phi_h} \sin\phi_{h,i} + \frac{B_i}{A_i} A_{UL}^{\sin 2\phi_h} \sin(2\phi_{h,i}) \right] + \\ + \lambda_i P_b D_F P_{T,i} \left[\frac{C_i}{A_i} A_{LL} + \frac{W_i}{A_i} A_{LL}^{\cos\phi_h} \cos\phi_{h,i} \right].$$

$$A_i = \frac{y_i^2}{2(1-\epsilon_i)}, \qquad B_i = A_i \epsilon_i, \qquad C_i = A_i \sqrt{1-\epsilon_i^2},$$
$$V_i = A_i \sqrt{2\epsilon_i(1+\epsilon_i)}, \quad W_i = A_i \sqrt{2\epsilon_i(1-\epsilon_i)}.$$

$$\boldsymbol{\mathcal{A}} = \left(A_{UL}^{\sin\phi_h}, A_{UL}^{\sin 2\phi_h}, A_{LL}, A_{LL}^{\cos\phi_h}, A_{UU}^{\cos\phi_h}, A_{UU}^{\cos 2\phi_h}, A_{LU}^{\sin\phi_h} \right).$$

$$\mathcal{N}_{UU}(\boldsymbol{\mathcal{A}}) = \frac{1}{M_0} \sum_{j=1}^{N_{\mathrm{MC}}} q_j \left[1 + \frac{V_j}{A_j} A_{UU}^{\cos\phi_h} \cos\phi_{h,j} + \frac{B_j}{A_j} A_{UU}^{\cos 2\phi_h} \cos(2\phi_{h,j}) \right],$$

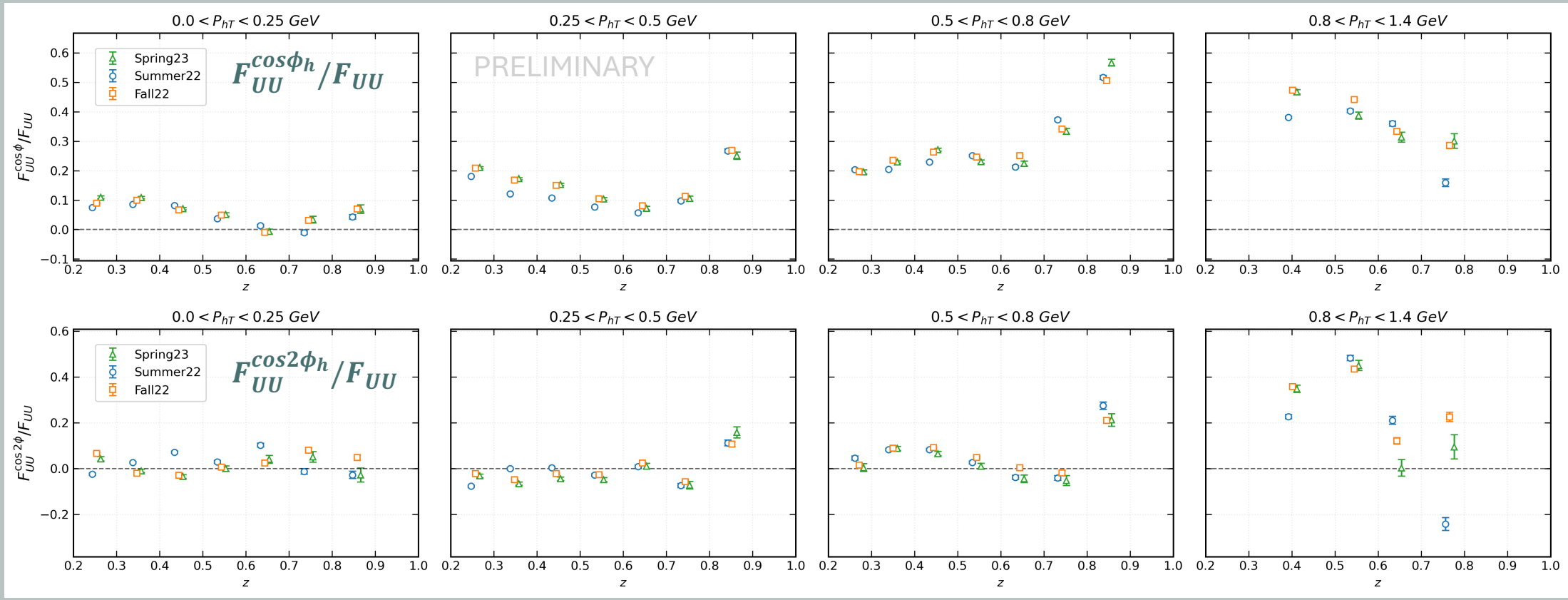
$$M_0 = \sum_j q_j,$$
$$M_1 = \sum_j q_j \sqrt{2\epsilon_j(1+\epsilon_j)} \cos\phi_{h,j},$$
$$M_2 = \sum_j q_j \epsilon_j \cos(2\phi_{h,j}).$$

$$\mathcal{N}_{UU}(\boldsymbol{\mathcal{A}}) = 1 + A_{UU}^{\cos\phi_h} \frac{M_1}{M_0} + A_{UU}^{\cos 2\phi_h} \frac{M_2}{M_0}.$$

$$-\mathcal{L}(\boldsymbol{\mathcal{A}}) = -\sum_{i=1}^{N} w_i \ln \left[\frac{F_i(\boldsymbol{\mathcal{A}})}{\mathcal{N}_{UU}(\boldsymbol{\mathcal{A}})} \right] \\ = -\sum_{i=1}^{N} w_i \ln F_i(\boldsymbol{\mathcal{A}}) + N_w \ln \mathcal{N}_{UU}(\boldsymbol{\mathcal{A}}).$$

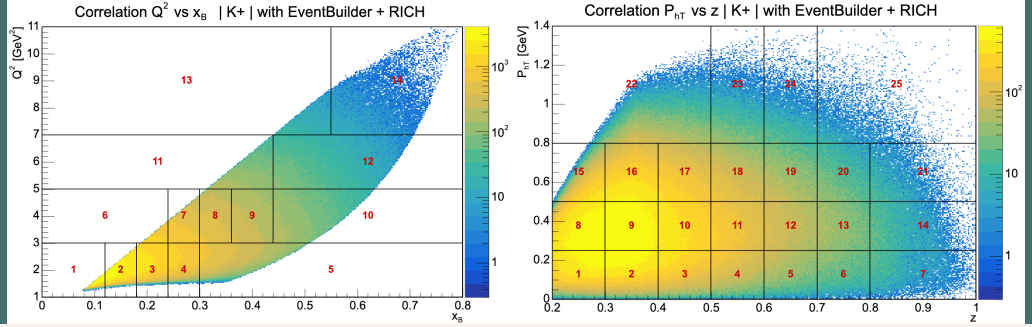
COMPARISON IN NH3 – zP_{hT}

Example of $F_{UU}^{cos\phi_h}/F_{UU}$ and $F_{UU}^{cos2\phi_h}/F_{UU}$ as a function of z & P_{hT} for the three campaigns.

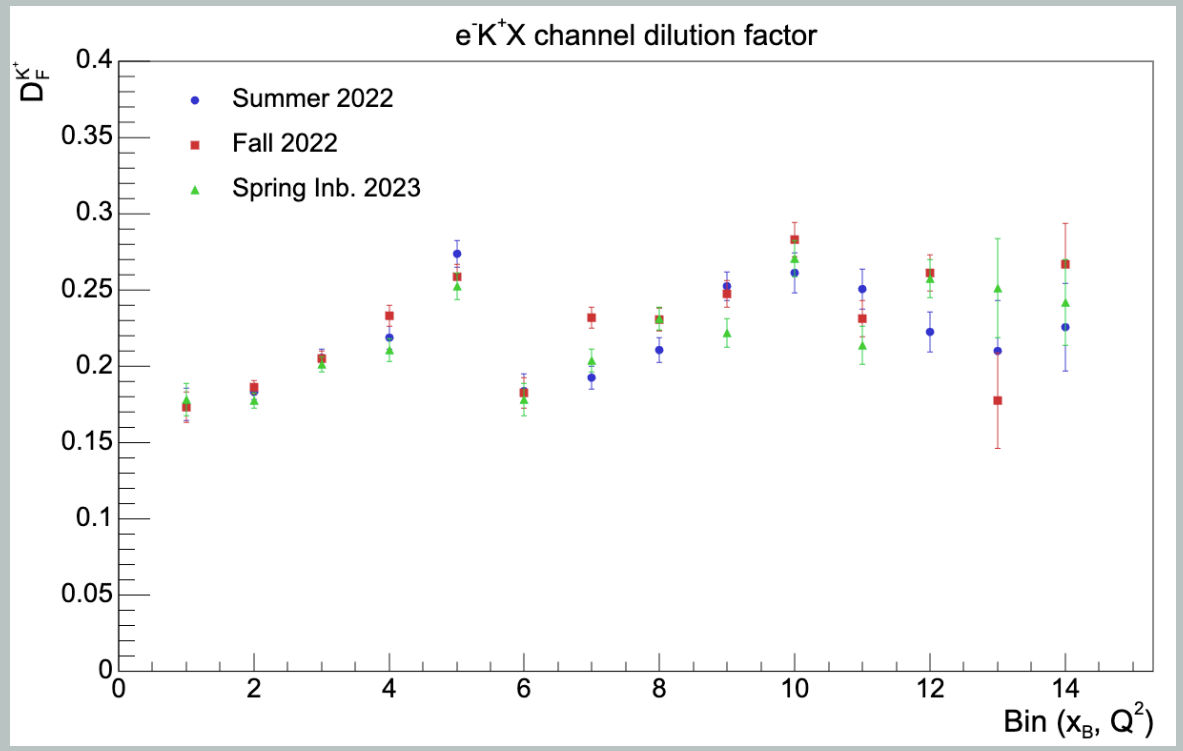


A BIAS ON THE Z AXIS IS PERFORMED TO HIGHLIGHT EACH CAMPAIGN RESULTS.

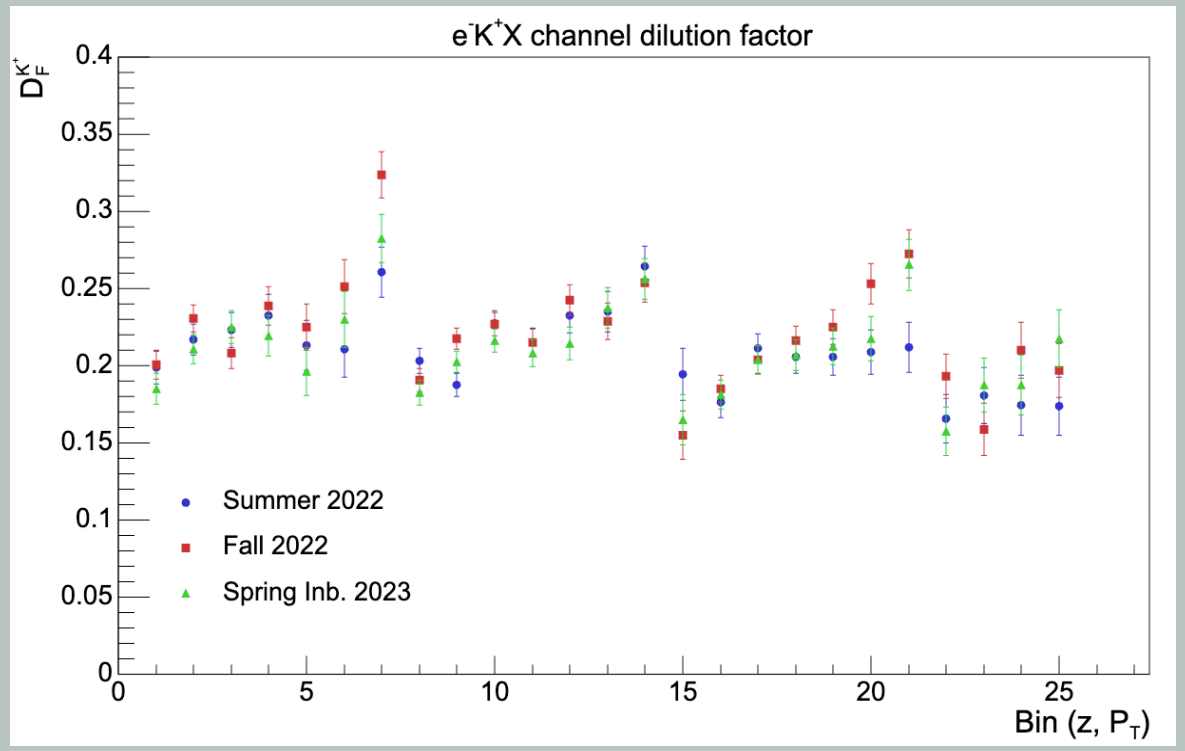
DILUTION FACTOR



FROM: https://clasweb.jlab.org/wiki/images/7/72/Dilution_Factor_Determination_for_RG_C_10-16-26.pdf



Dilution factor in my DIS variable binning grid.



Dilution factor in my SIDIS variable binning grid.