

KaonLT Meeting

October 31st, 2025

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SIMC Variables

- Variables adjusted in
 - results_write.f => Define Ntuples
 - NtupleInit.f => Names ntuples (ROOT branch names)
- Lab variables (all these are recalculated with recon_hcana)
 - Cross section calculations
 - $Q^2 = \text{recon}\%Q^2$
 - $W = \text{recon}\%W$
 - $t = \text{ntup}\%t$
 - $\text{phipq} = \text{recon}\%\text{phi_pq}$ (0 to 2π)
 - $\text{thetapq} = \text{recon}\%\text{theta_pq}$ (0 to 2π)
 - $\text{epsilon} = \text{recon}\%\text{epsilon}$
- Vertex variables
 - Reweighting for iterations
 - $Q^2_i = \text{vertex}\%Q^2$
 - $W_i = \text{main}\%w$
 - $t_i = \text{main}\%t$
 - $\text{phipqi} = \text{phicm} = \text{main}\%\text{phicm}$ (0 to 2π)
 - $\text{thetapqi} = \text{thetacm} = \text{main}\%\text{thetacm}$ (0 to 2π)
 - $\text{epsilon}_i = \text{epscm} = \text{main}\%\text{epsilon}$
- Note: hcana (and recon_hcana) all angles are $(-\pi \text{ to } \pi)$

```
ntu(25) = recon%q/1000.      !q - GeV/c
ntu(26) = recon%nu/1000.     !nu - GeV
ntu(27) = recon%Q2/1.e6      !Q^2 - (GeV/c)^2
ntu(28) = recon%W/1000.      !W - GeV/c
ntu(29) = recon%epsilon      !epsilon
```

```
NtupleTag(m) = 'q'          ! 25
m = m+1
NtupleTag(m) = 'nu'         ! 26
m = m+1
NtupleTag(m) = 'Q2'         ! 27
m = m+1
NtupleTag(m) = 'W'          ! 28
m = m+1
NtupleTag(m) = 'epsilon'    ! 29
m = m+1
```

Constants:

$$\pi, \quad m_{\text{tar}} = 0.93827231, \quad m_{\pi^+} = 0.139570, \quad m_{K^+} = 0.493677$$

$$t_{\text{av}} = (0.05032 + 0.01345 \ln Q_{\text{set}}^2) Q_{\text{set}}^2,$$

$$f_{t\text{av}} = \frac{|t| - t_{\text{av}}}{t_{\text{av}}},$$

$$f_t = \frac{|t|}{(|t| + m_{K^+}^2)^2},$$

$$\sigma_L = (p_1 f_t) \exp(-|p_2 t|),$$

$$\sigma_T = \frac{p_5}{|t|^{p_6}} \exp(-|p_7 t|),$$

$$\sigma_{LT} = \frac{p_9}{|t|} \sin \theta$$

$$\sigma_{TT} = \frac{p_{13}}{|t|^{p_{14}}} \exp(-|p_{15} t|) \sin^2 \theta$$

$$w_{\text{factor}} = \frac{1}{(W^2 - m_{\text{tar}}^2)^{0.85} W_{\text{set}}^2 - 5.97 W_{\text{set}} + 12.68}.$$

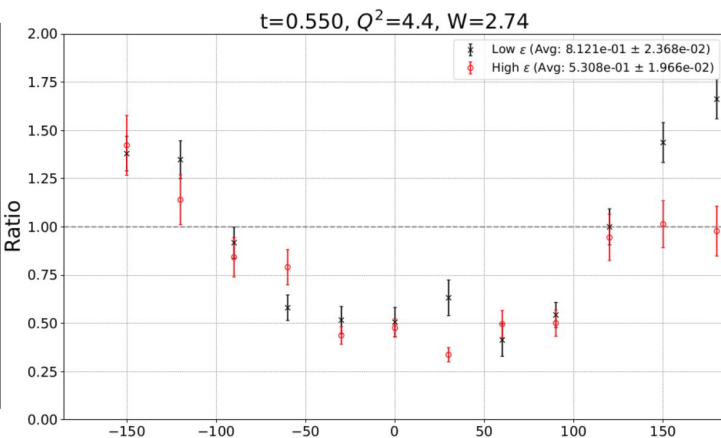
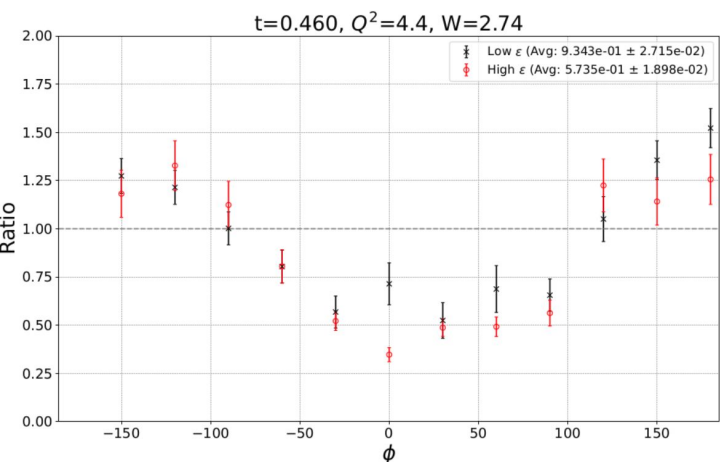
Proper SIMC theta used

- `results_write.f+NtupleInit.f`
misassigned `thetapq` and `thetacm`

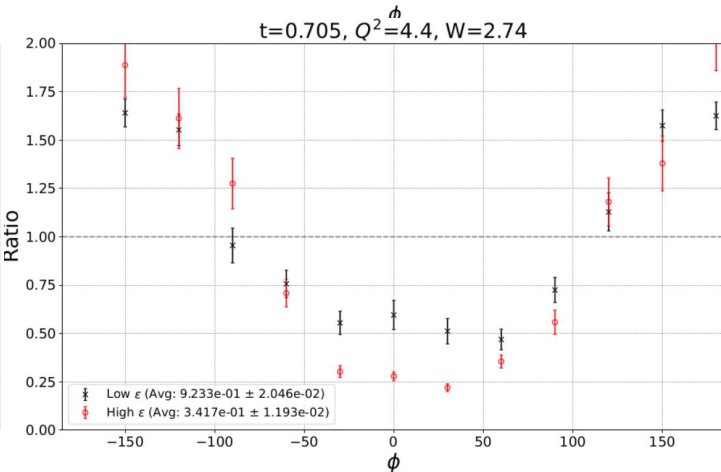
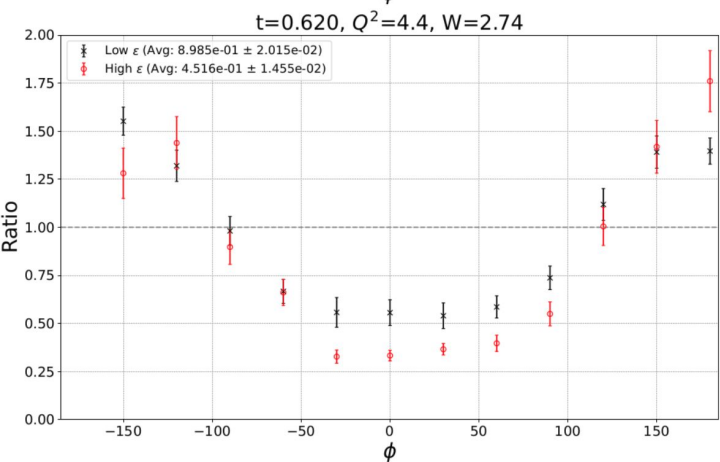
Data has pion subtraction and empirical fit

- No Σ fit

$$Q^2=4.4, W=2.74 \mid 1.10 \leq M_K \leq 1.14, 0.88 \leq M_\pi \leq 0.94$$



Proper SIMC theta used



Next Steps for Analysis

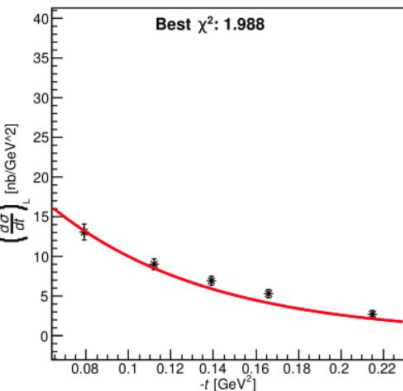
- Reanalyze...
 - $Q^2=3.0/W=2.32$
 - $Q^2=4.4/W=2.74$ (Kin's parallel check)
 - $Q^2=5.5/W=3.02$
- Once Kin's workflow is setup...
 - $Q^2=2.115/W=2.95$
 - $Q^2=3.0/W=3.14$
- Refine model, last fit optimizations **(Mid-November)**
 - Global fit for $Q^2=3.0(2.32)$, 4.4, 5.5
 - If furlough...
 - Focus will be on finishing algorithm studies+paper
- Final full replay and finalize systematics study **(Before Christmas)**

EXTRA

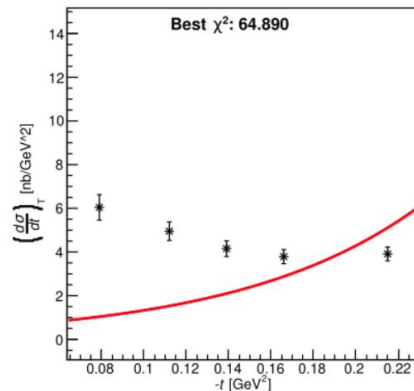
Fpi-2 Fits from ariv 0809.3161

$Q^2=1.6$, $W=2.22$

Sigma L Model Fit

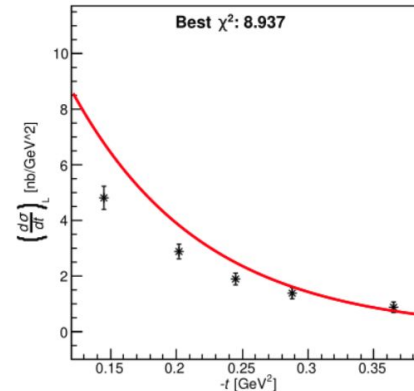


Sigma T Model Fit

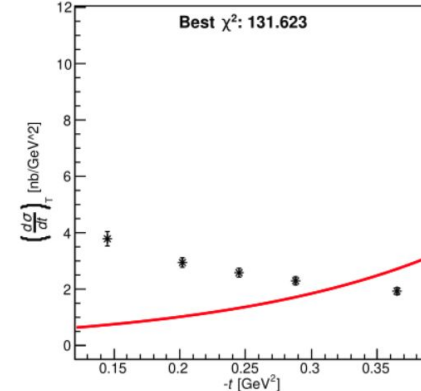


$Q^2=2.45$, $W=2.22$

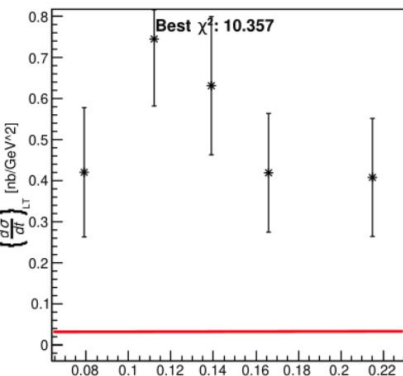
Sigma L Model Fit



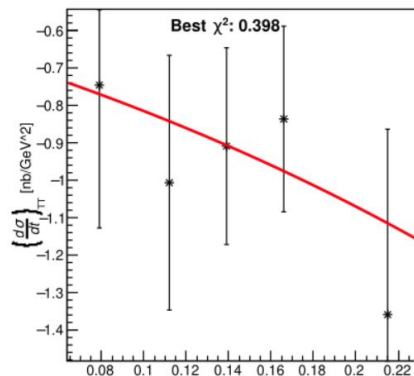
Sigma T Model Fit



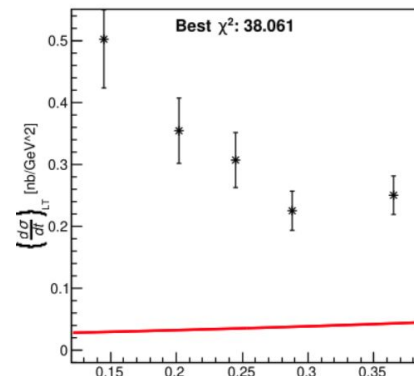
Sigma LT Model Fit



Sigma TT Model Fit



Sigma LT Model Fit



Sigma TT Model Fit

