

KaonLT Meeting

November 20-21st, 2025

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Constants:

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

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

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

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

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

$$\sigma_T = p_5 \exp(-|p_6 t|),$$

$$\sigma_{LT} = p_9 \exp(-|p_{10} t|) \sin^2 \theta,$$

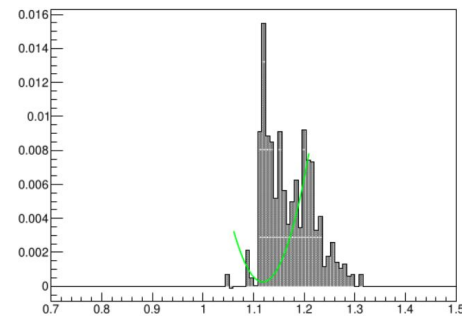
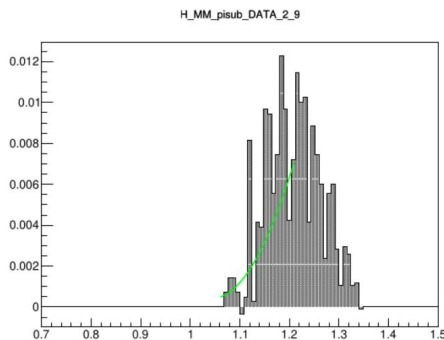
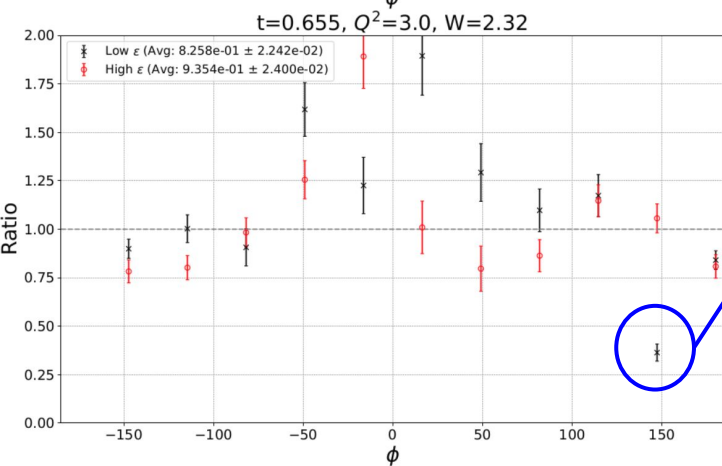
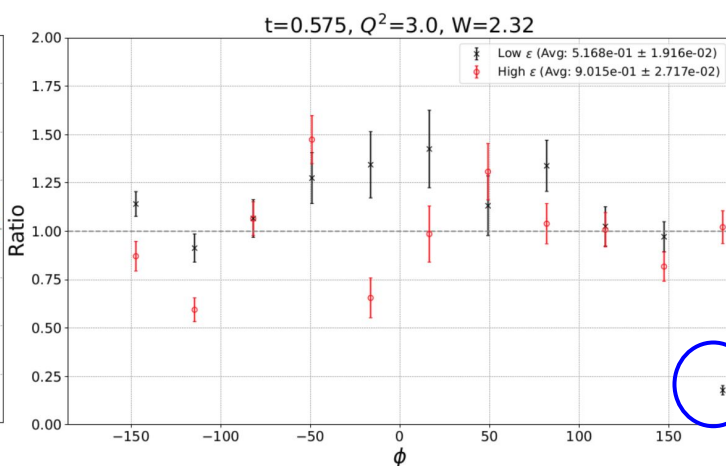
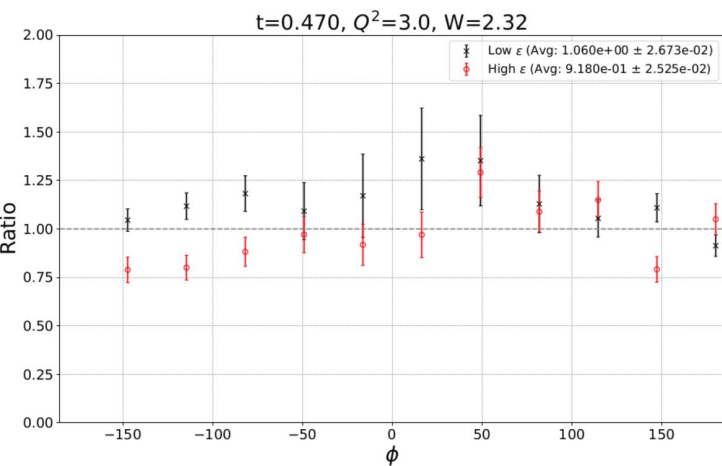
$$\sigma_{TT} = p_{13} \exp(-|p_{14} t|) \sin^2 \theta,$$

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

Data has pion subtraction and empirical fit

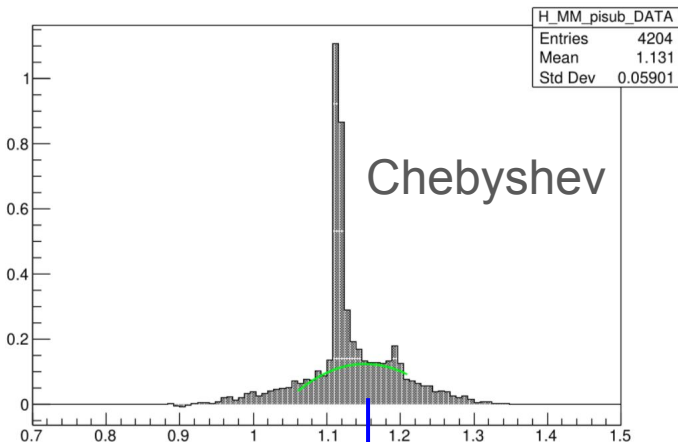
- No Σ fit

$$Q^2=3.0, W=2.32 \mid 1.10 \leq M_K \leq 1.14, 0.88 \leq M_\pi \leq 0.94 \quad i=3$$

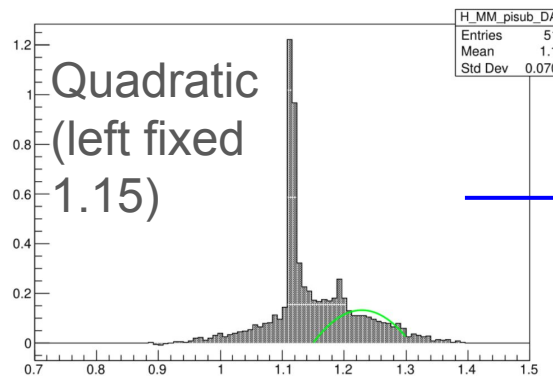


$$Q^2=3.0, W=2.32 \mid 1.10 \leq M_K \leq 1.14, 0.88 \leq M_\pi \leq 0.94 \quad i=3$$

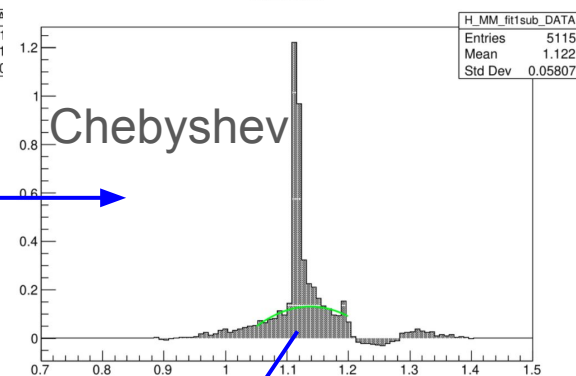
MM_pisub_K



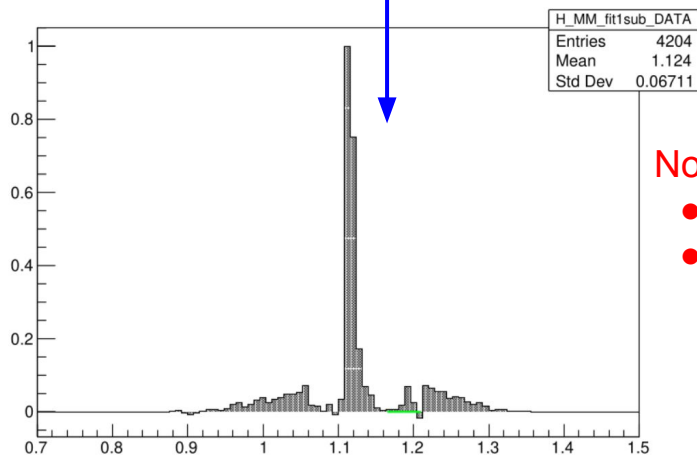
MM_pisub_K



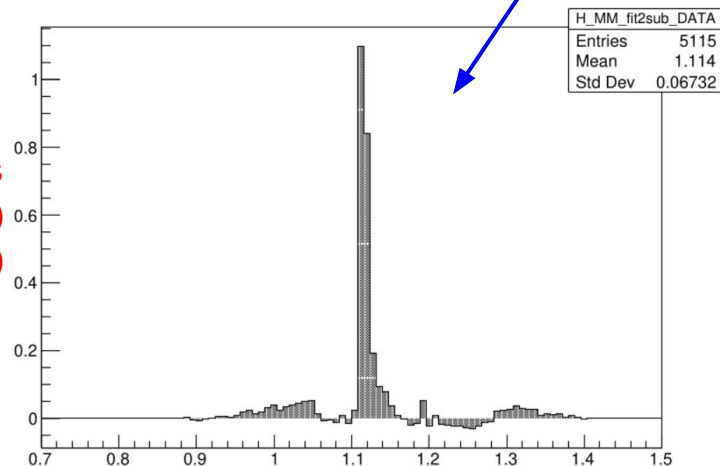
MM_fit1sub_K



MM_fit1sub_K



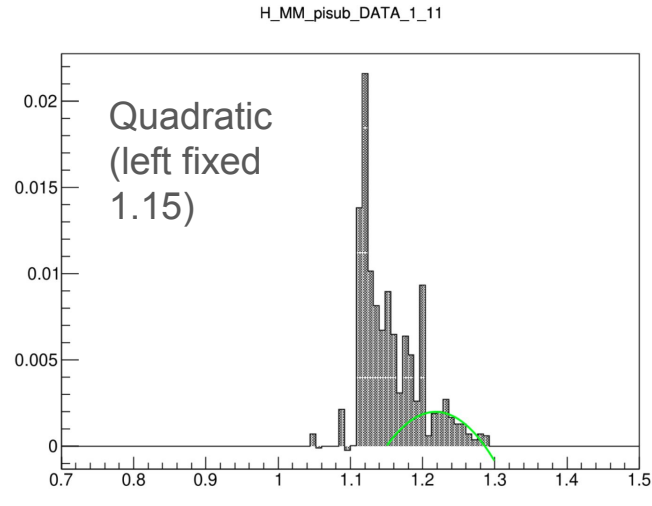
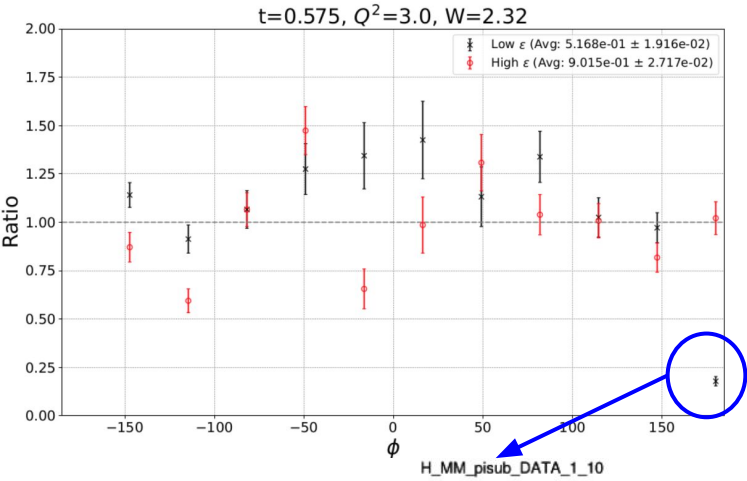
MM_fit2sub_K



Note: t-range changes

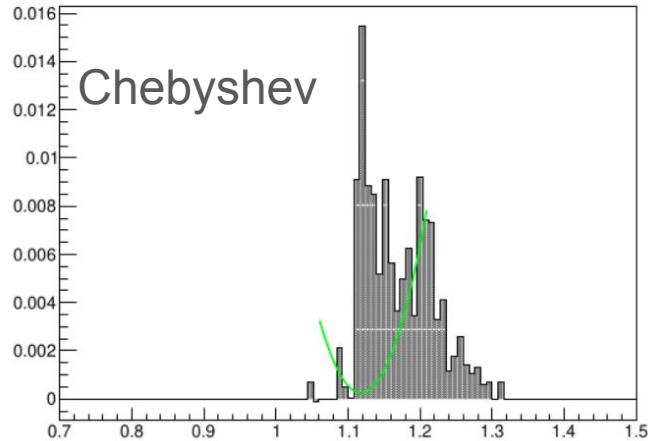
- 0.4-0.7 (3 t-bins)
- 0.4-0.8 (4 t-bins)

$$Q^2=3.0, W=2.32 \mid 1.10 \leq M_K \leq 1.14, 0.88 \leq M_\pi \leq 0.94 \quad i=3$$



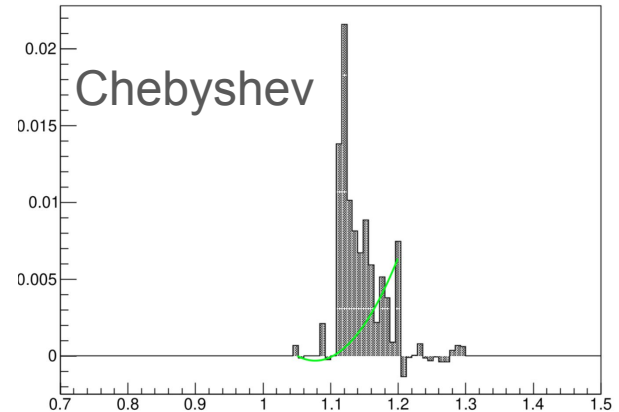
**Still adjusting
fitting
parameters**

- For instance,
fixing quad to
1.12 instead of
1.15



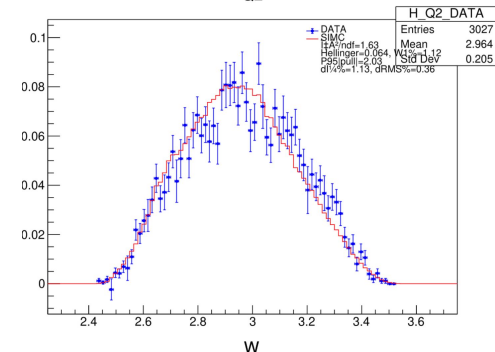
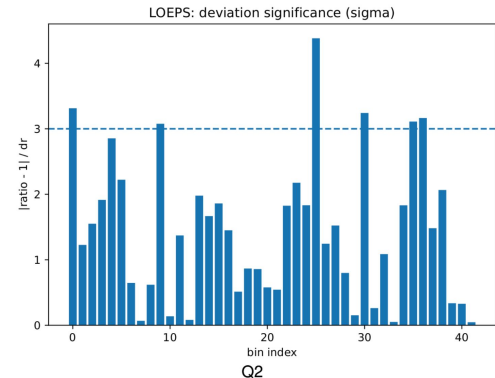
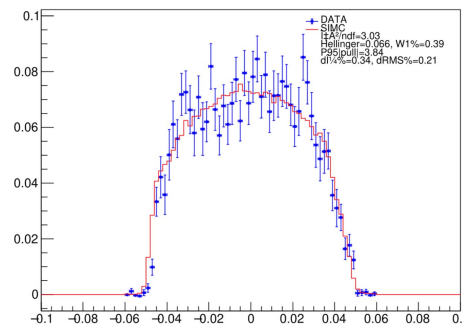
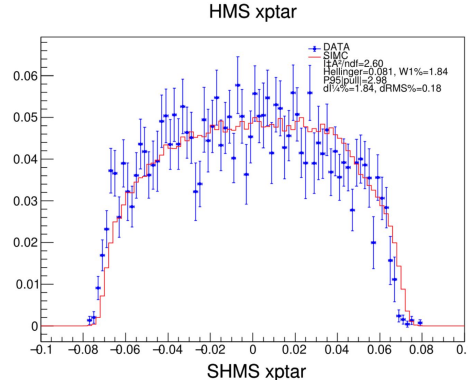
Note: t-range changes

- 0.4-0.7 (3 t-bins)
- 0.4-0.8 (4 t-bins)

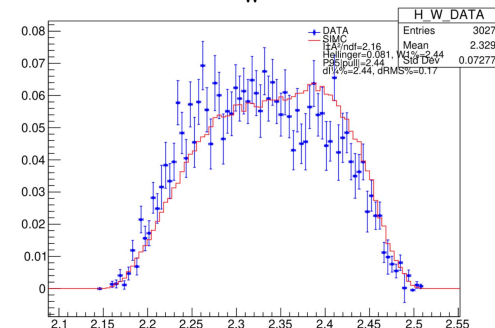


Analysis Breakdown

- The uncertainty of empirical fits are likely under calculating the error size
 - Need to encompass fit shape, edges for more realistic error values
- Good set of functional forms and parameterization, but refinement needed
 - $Q^2=3.0/W=2.32$ [Needs refinement]
 - $Q^2=4.4/W=2.74$ [Needs refinement]
- Refinement:
 - Fix bad bins, assuring all bin by bin fits are well behaved
 - Goal: all ratios within 3 sigma and average within 15% of unity at 0th iteration
 - Reparameterize and iterate
 - Goal: all kinematic comparisons within $\chi^2 < 2.0$
- Use the established functional forms and parameterization for low statistics setting
 - $Q^2=5.5/W=3.02$ (Next up)



Plots are
 $Q^2=3.0/W=2.32$
 Center low eps
Still adjusting fitting parameters



Next Steps for Analysis

- Richard...
 - $Q^2=3.0/W=2.32$ [Needs refinement]
 - $Q^2=4.4/W=2.74$ [Needs refinement]
 - $Q^2=5.5/W=3.02$ (**Next up**)
- Kin...
 - $Q^2=2.115/W=2.95$
 - $Q^2=3.0/W=3.14$ (Kin's current focus)
- Refine model, last fit optimizations (**Late-November**)
 - Global fit for $Q^2=3.0(2.32)$, 4.4, 5.5
 - Once Kin finishes $Q^2=3.0/W=3.14$
 - He will do cross section checks/systematics on $Q^2=3.0(2.32)$, 4.4, 5.5
 - While Kin does this...
 - Richard will focus will be on finishing fit algorithm studies+paper (Fpi1/2,Pion/KaonLT low Q^2)
- Final full replay and finalize systematics study (**Before Christmas**)
 - Sameer is finishing up cointime blocking correction
 - Once finished, we can begin full replay
 - When full replay is ready...
 - Richard can check Kin's systematics (consistency check)

EXTRA