

KaonLT Meeting

October 16th, 2025

Richard L. Trotta

Constants:

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

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

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

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

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

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

$$\sigma_{LT} = \frac{p_9}{|t|},$$

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

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

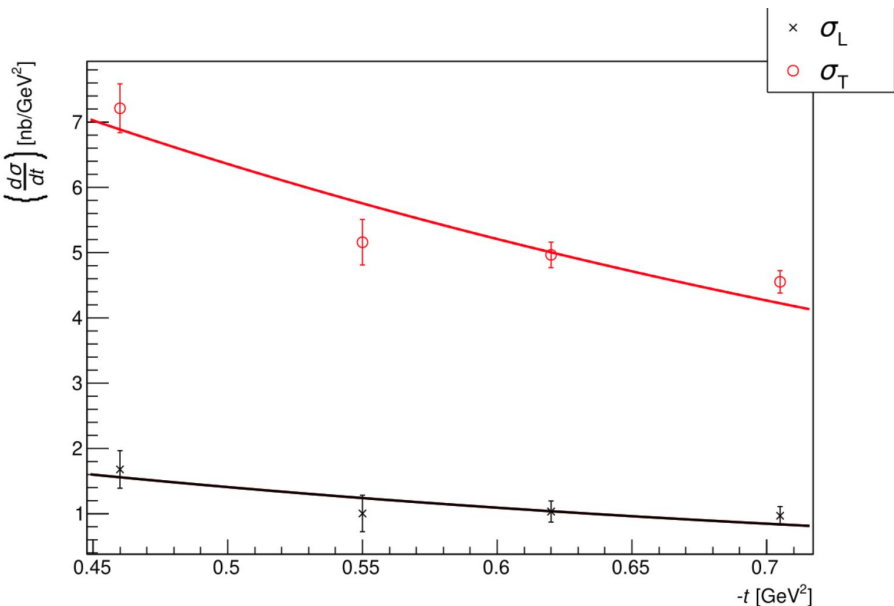
**KaonLT
Analysis**

Data has pion subtraction and empirical fit

- No Σ fit

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

Best fit parameterization (from last week)



1.47381e+00	1	0.3
0.00000e+00	2	0.3
0.00000e+00	3	4.3
0.00000e+00	4	4.3
3.55077e+00	5	0.1
8.96095e-01	6	0.1
5.30272e-08	7	0.1
-5.26738e-01	8	6.4
1.57669e+00	9	0.3
4.00178e+00	10	0.5
-1.85133e+02	11	0.5
0.00000e+00	12	0.5
4.15323e+05	13	0.5
-6.62666e+00	14	0.5
-1.40922e+01	15	0.5
1.85370e-08	16	4.8

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

$$\sigma_s(Q^2) \propto (Q^2)^{n_s}$$

$$n_{s,j} = \frac{\ln \sigma_{2,j} - \ln \sigma_{1,j}}{\ln Q_2^2 - \ln Q_1^2}$$

$$n_s = \frac{d \ln \sigma_s}{d \ln Q^2}$$

$$\sigma_{\text{scaled}}(Q_{\text{ref}}^2) = \sigma(Q_{\text{src}}^2) \left(\frac{Q_{\text{ref}}^2}{Q_{\text{src}}^2} \right)^{n_s}$$

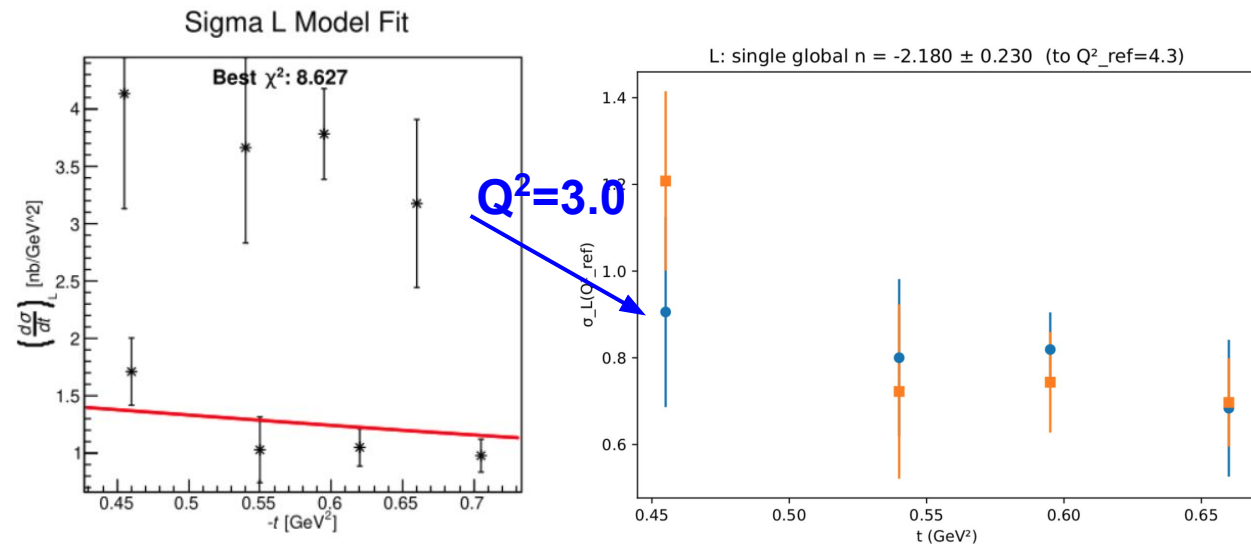
$$Q_{\text{ref}}^2 = 4.3, W_{\text{ref}} = 2.70$$

$$w_{\text{factor}}^{\text{norm}} = \frac{(W_{\text{ref}}^2 - m_{\text{tar}}^2)^{n_{\text{ref}}}}{(W_{\text{src}}^2 - m_{\text{tar}}^2)^{n_{\text{src}}}}$$



Procedure from F π -1/2

Q^2 dependence (power-law scaling)



Ignore red fit

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

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

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

$$\sigma_{LT} = \frac{p_9}{|t|},$$

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

$$\sigma_L = (p_1 f_t) \exp(-|p_2 t|) \left(\frac{4.3}{Q^2} \right)^{-2.18},$$

$$\sigma_T = \frac{p_5}{|t|^{p_6}} \exp(-|p_7 t|) \left(\frac{4.3}{Q^2} \right)^{-1.89},$$

$$\sigma_{LT} = \frac{p_9}{|t|} \left(\frac{4.3}{Q^2} \right)^{-2.01},$$

$$\sigma_{TT} = \frac{p_{13}}{|t|^{p_{14}}} \exp(-|p_{15} t|) \left(\frac{4.3}{Q^2} \right)^{-2.34}.$$

Next Steps for Analysis

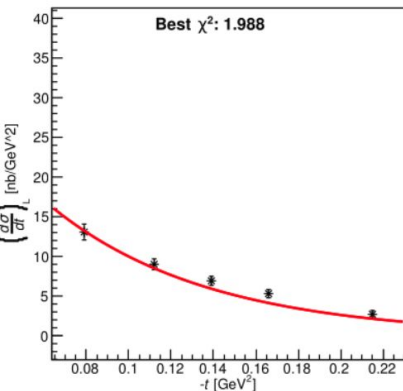
- Reanalyze...
 - $Q^2=3.0/W=2.32$
 - $Q^2=4.4/W=2.74$ ✓
 - $Q^2=5.5/W=3.02$
- Kin's work...
 - $Q^2=2.115/W=2.95$
 - $Q^2=3.0/W=3.14$
- Refine model, last fit optimizations **(Mid-October)**
 - Global fit for $Q^2=3.0(2.32)$, 4.4, 5.5
 - May need to be adjusted due to furlough
 - Focus will be on finishing algorithm studies+paper
- Preliminary systematics study **(Start of November)**
- Final full replay and finalize systematics study **(Before Thanksgiving)**

EXTRA

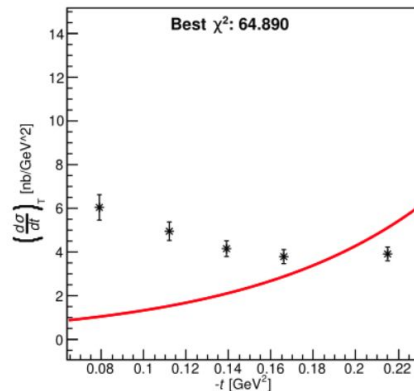
Fpi-2 Fits from ariv 0809.3161

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

Sigma L Model Fit

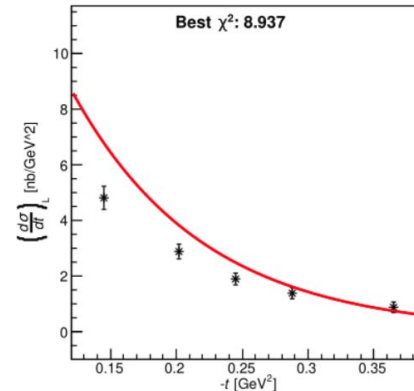


Sigma T Model Fit

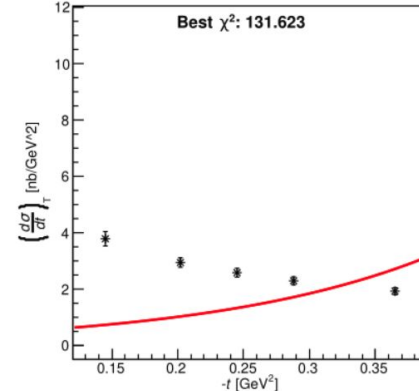


$Q^2=2.45$, $W=2.22$

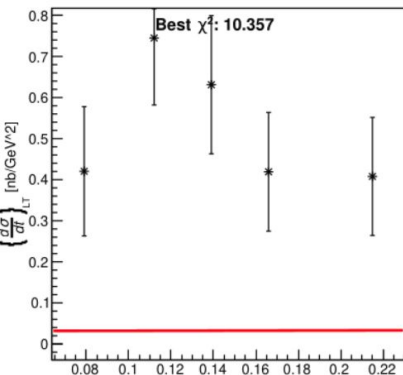
Sigma L Model Fit



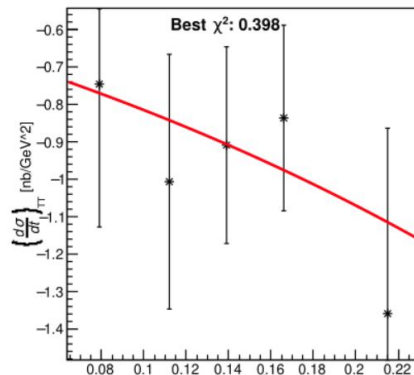
Sigma T Model Fit



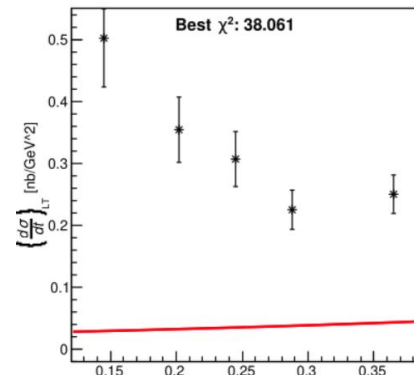
Sigma LT Model Fit



Sigma TT Model Fit



Sigma LT Model Fit



Sigma TT Model Fit

