

Pion and Kaon Structure Functions at JLEIC

Richard Trotta

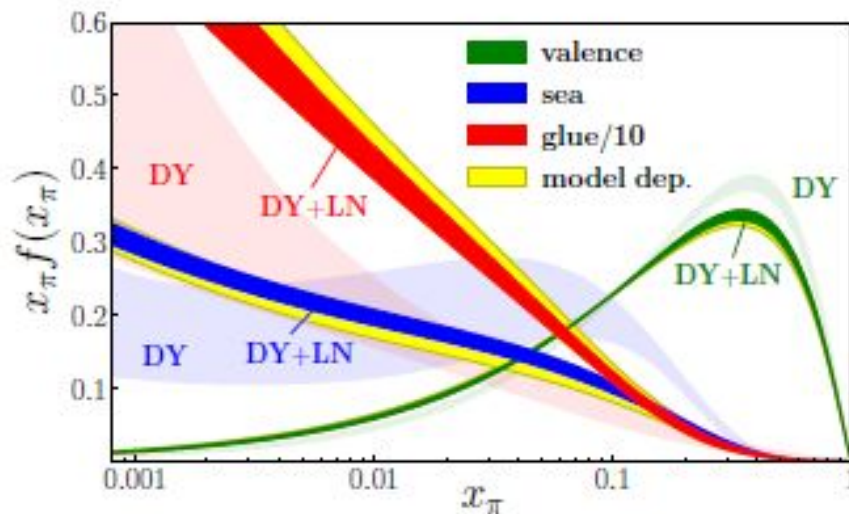
In collaboration with...

Vladimir Berdnikov, Tanja Horn, Nicholas
Mecholsky, Ian Pegg, Nobuo Sato



Pion Global PDF Impact for both DY and LN

- Plot from *Barry et al.* shows that DY has significantly high uncertainty
 - See Nobuo's talk from earlier
- LN will be our focus

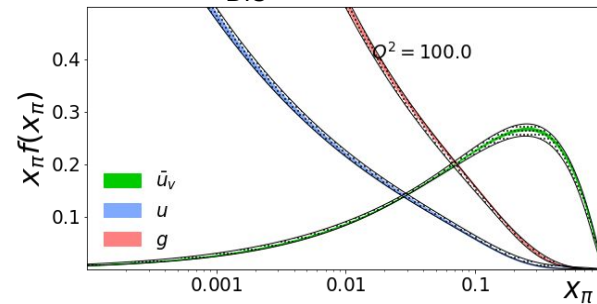
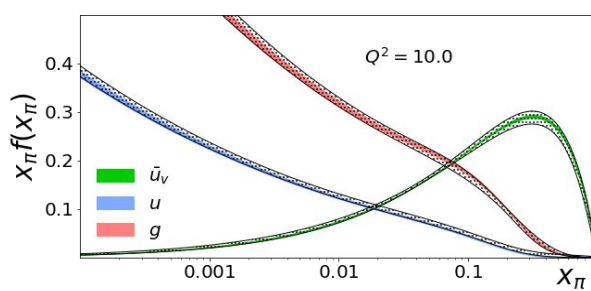


Pion Global PDF Impact Including EIC Projections

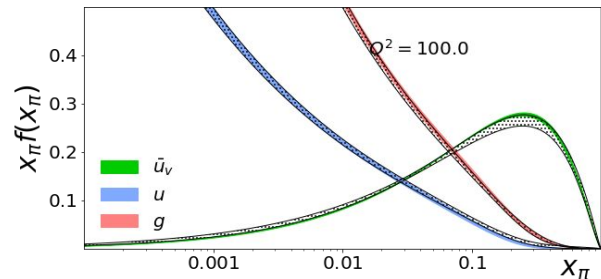
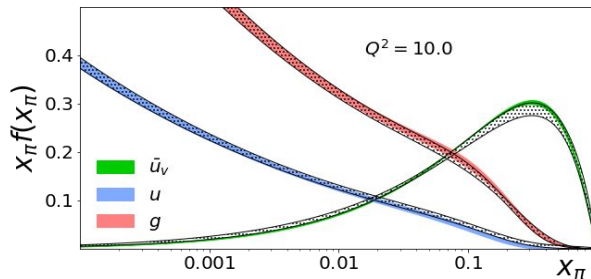
- πN t -exponential splitting function (*McKenney et al.*) with a $y < 0.2$ cut ($y = k^+/p^+$ NOT y_{DIS})
- 1% uncertainty assumed for cross section
- Can create similar plots for kaon by changing the value of the coupling constant

$$\mathcal{F} = \begin{cases} \text{(i)} & \exp((M^2 - s)/\Lambda^2) & s\text{-dep. exponential} \\ \text{(ii)} & \exp(D_{\pi N}/\Lambda^2) & t\text{-dep. exponential} \\ \text{(iii)} & (\Lambda^2 - m_\pi^2)/(\Lambda^2 - t) & t\text{-dep. monopole} \\ \text{(iv)} & \bar{x}_L^{-\alpha_\pi(t)} \exp(D_{\pi N}/\Lambda^2) & \text{Regge} \\ \text{(v)} & [1 - D_{\pi N}^2/(\Lambda^2 - t)^2]^{1/2} & \text{Pauli-Villars} \end{cases}$$

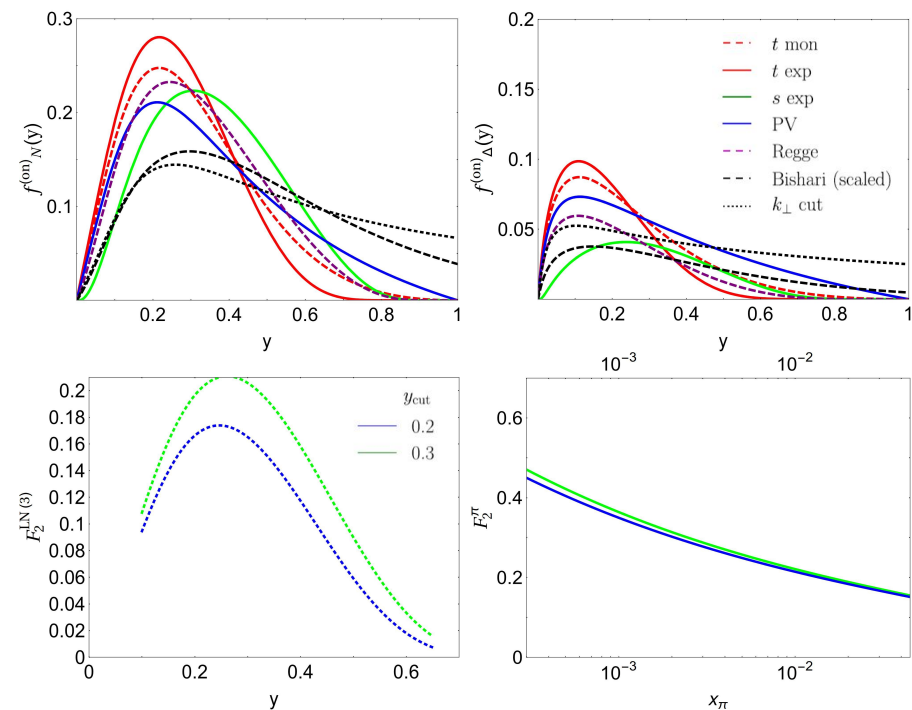
Kinematics: $\{0.01 < x < 0.08, 1.25 < Q^2 < 80.0, 0.1 < y_{\text{DIS}} < 0.8\}$



Kinematics: $\{0.1 < x < 0.8, 12.5 < Q^2 < 800, 0.1 < y_{\text{DIS}} < 0.8\}$



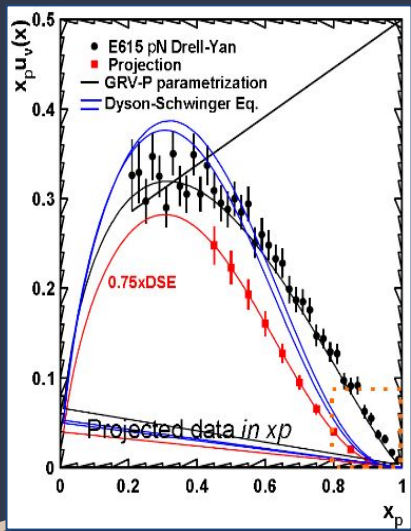
Recreation of Tagged Neutron Structure Function



- Recreated from *McKenney et al.* by Nick Mecholsky
- N & Δ splitting functions look good, as does the S.F. but the tagged neutron S.F. is off
- Goal is to parameterize the kaon in a similar global impact plot of EIC data on PDFs

$$F_2^{LN(3)}(x, Q^2, y) = 2f_N^{(on)}(y)F_2^{\pi}(x_{\pi}, Q^2)$$

Conclusion



- Global impact of pion is well documented with good projections for EIC data at low to moderate x .
- Kaon global impact is scarce.
- There are two approaches for obtaining EIC projections for kaon...
 - Global PDF Impact plot similar to pion with a change in the coupling constant
 - More rigorously through parameterization similar to *McKenney et al.* did for the pion
- Both methods will provide crucial analysis for the impact of EIC accessible kinematics and projected uncertainties on global PDF fits.
- See talks by Rachel, Rik, and Vladimir

Extra Slides

