

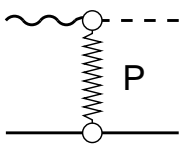
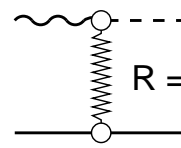
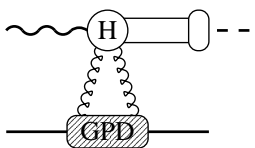
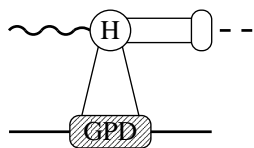
Non-diffractive meson production (π^+) with EIC

Ch. Weiss (with V. Guzey), Jefferson Lab

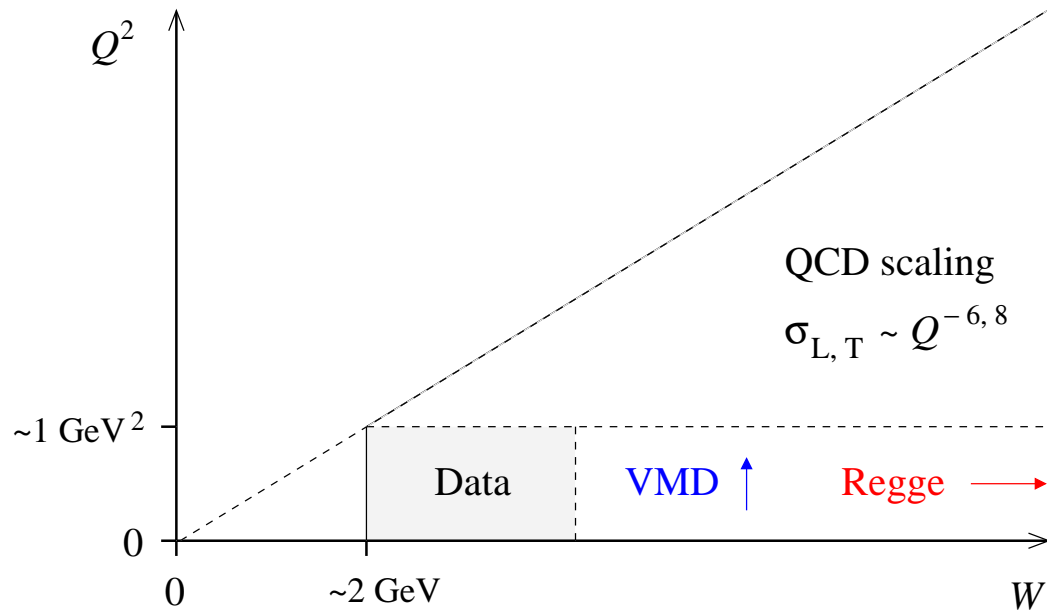
EIC Collaboration Meeting, Stony Brook, Dec. 7-8, 2007

- Parametrization of cross sections for exclusive electroproduction
 $ep \rightarrow e'n\pi^+$ in collider kinematics ($W \gg 1\text{GeV}$, $0 < Q^2 < \text{few GeV}^2$)
 - First counting rate estimates for EIC (preliminary!)
 - Many interesting physics questions
 - Reaction mechanism: Transition from “soft” to “hard” regime
 - Nucleon structure: Quark QPDs, spin/ flavor distributions
 - Pion form factor [JLab]
- Talk by M. Strikman

Exclusive processes at collider energies

	diffractive	non-diffractive
	vacuum exchange	quantum number exchange
	$\gamma^* p \rightarrow \rho^0 p, \gamma p, J/\psi + p, \dots$	$\gamma^* p \rightarrow \pi N, K\Lambda, \rho^+ n, \dots$
“soft”	 <p>Pomeron exchange $\sigma \sim s^{0+\epsilon}$</p>	 <p>Reggeon exchange $\sigma \sim s^{-1} - s^{-2}$</p>
“hard”	 <p>gluon GPD</p> <p>transverse gluon imaging</p> <p>“one channel”</p>	 <p>non-singlet quark GPD</p> <p>quark imaging (spin/flavor)</p> <p>“many channels”</p>

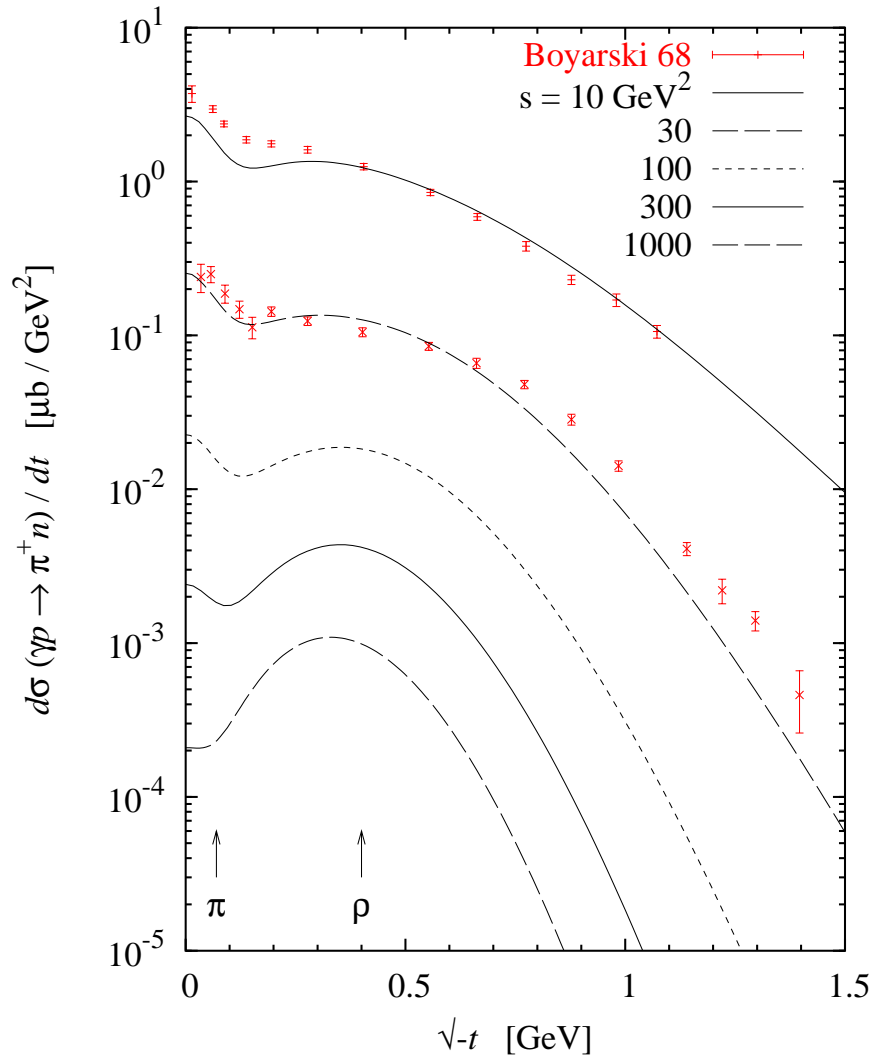
Exclusive pion production: Landscape



- Simple analytic form (suitable for MC)

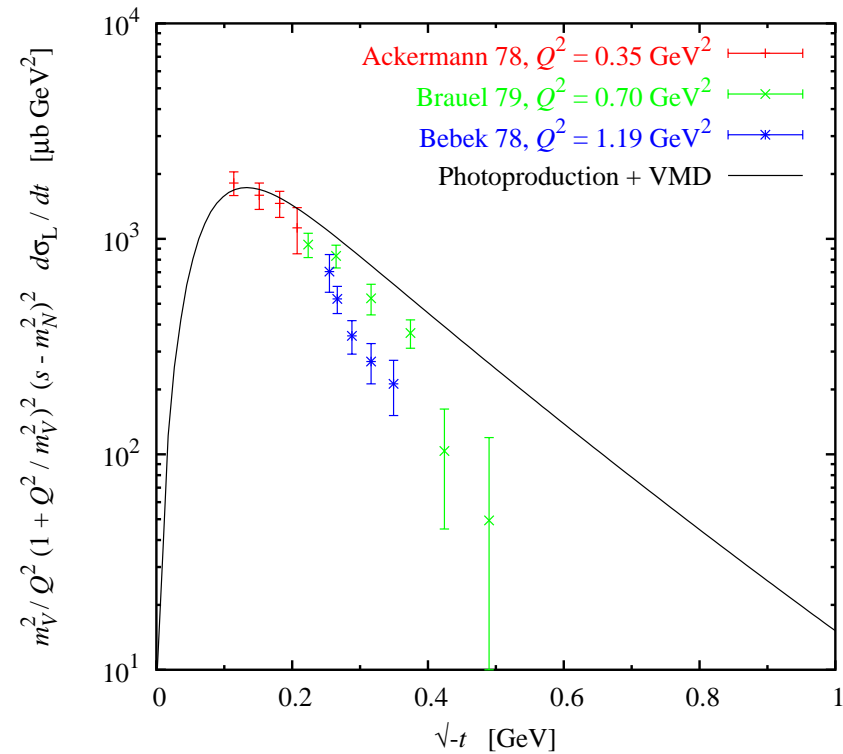
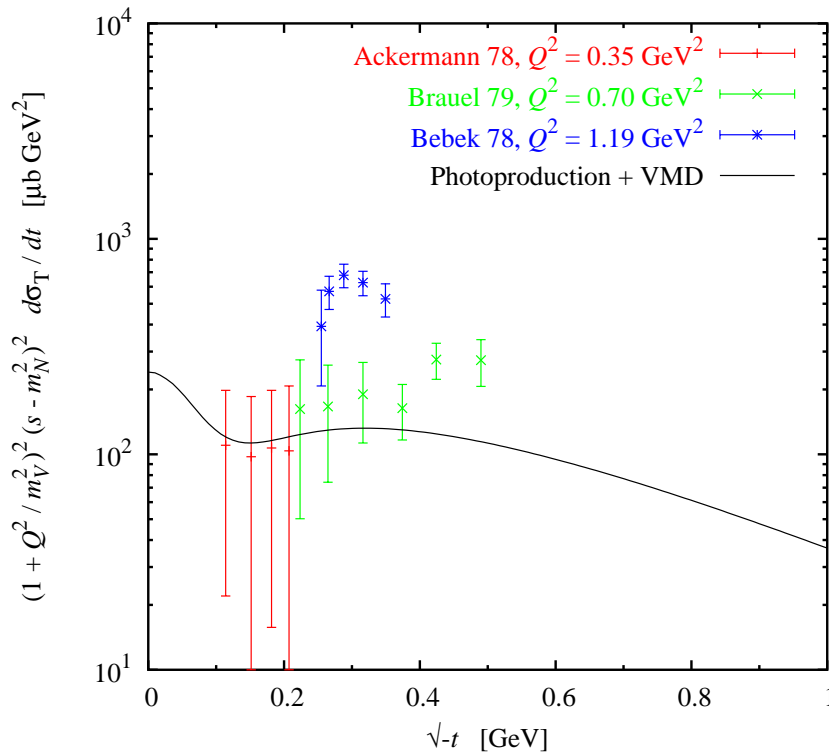
- Phenomenological parametrization based on
 - Regge model ($Q^2 = 0$)
 - VMD ($Q^2 < 1 \text{ GeV}^2$)
 - QCD scaling
- Correct limiting behavior at large W, Q^2

Exclusive pion production: $Q^2 = 0$



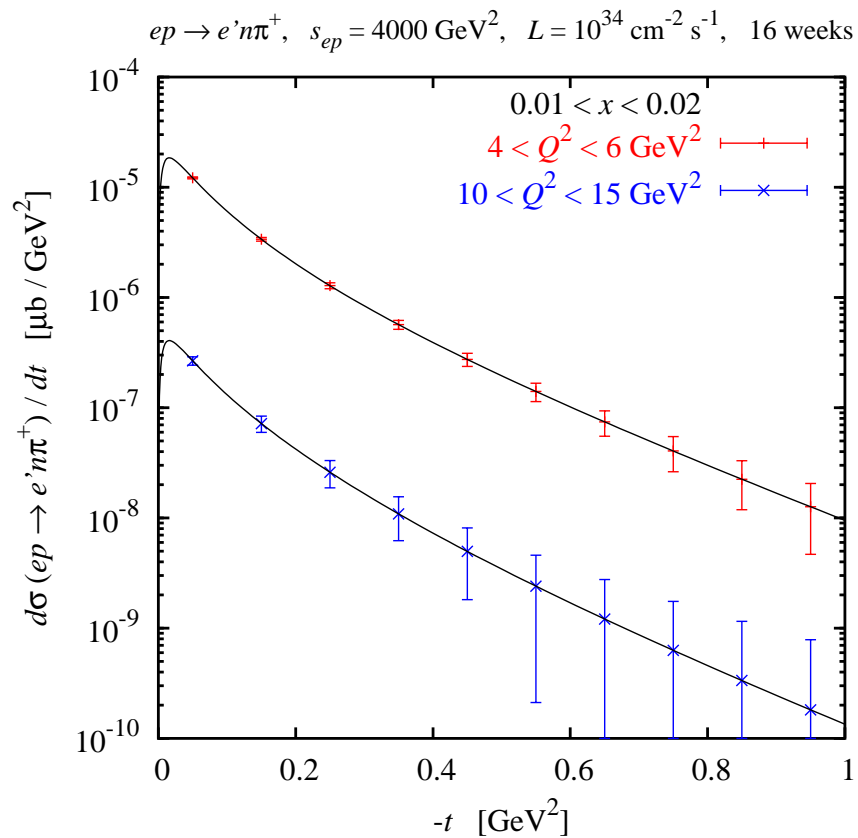
- Non-uniform t -dependence:
Pion exchange + “something”
- Data well described by Regge models with $\pi + \rho$ trajectories
e.g. Reggeized Born term model
[Guidal, Laget, Vanderhaeghen 98]
- t -dependence predicted to change with s

Exclusive pion production: $Q^2 < 1 \text{ GeV}^2$



- Vector meson dominance works reasonably for $W > 2 \text{ GeV}$ and $Q^2 \sim M_\rho^2$
- L/T ratio at larger t ?

Exclusive pion production at EIC: First estimates



Luminosity	$10^{34} \text{ cm}^{-2} \text{ s}^{-1}$
Running time	16 weeks
Energy	10 on 100 GeV
Detection	100%

PRELIMINARY

- Many uncertainties (model dependence, extrapolations)
- No proper integration ($d\sigma \times$ bin size)
- Seems feasible at not too small x ($\sim 0.05 - 0.1$)

Summary and Outlook

- Exclusive π^+ production looks feasible with high-luminosity EIC
→ Many interesting options!
- Test/improve parametrization
- Full MC simulations [with A. Bruell, T. Horn]
- Alt. parametrization based on GPD models + higher twist
- Connection with pion form factor measurements at JLab
(L/T , pole-background separation)
- Other channels (K, π^0, η, ρ^+)