Pion Form Factor and Factorization to the highest Q^2 (E12-06-101 and E12-07-105)

S. Ali, D. Androic, K. Aniol, J. Arrington, A. Asaturyan, F. Benmokthar, V. Berdnikov, D. Biswas, W. Boeglin, P. Bosted, E.J. Brash, W. Boeglin, A. Camsonne, M. Carmignotto, J.-P. Chen, E.Christy, S. Covrig-Dusa, D. Day, D. Crabb, W. Deconinck, M. Diefenthaler, D. Dutta, M.Elaasar, R. Ent, D. Gaskell, H. Fenker, E. Fuchey, D. Hamilton, O. Hansen, F. Hauenstein, D.Higinbotham, **T. Horn**, G.M. Huber, C.E. Hyde, M. Jones, S. Joosten, S. Kay, D. Keller, C.Keppel, P. King, E. Kinney, M. Kohl, V. Kumar, W. Li, A. Liyanage, D. Mack, S. Malace, P.Markowitz, R. Michaels, A. Mkrtchyan, H. Mkrtchyan, M. Muhoza, C. Munoz-Camacho, A.Puckett, G. Niculescu, I. Niculescu, Z. Papandreou, J. Roche, B. Sawatzky, S. Sirca, G.R.Smith, H. Szumila, V. Tadevosyan, R. Trotta, A. Teymurzyan, A. Usman, B. Wojtsekhowski, S. Wood, C. Yero

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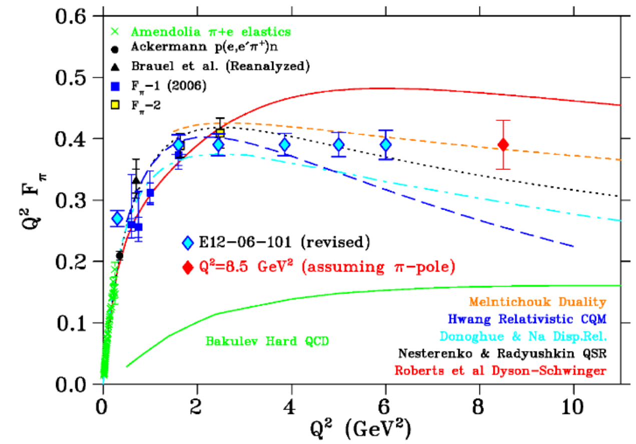
E12-06-101/E12-07-105 (PionLT)

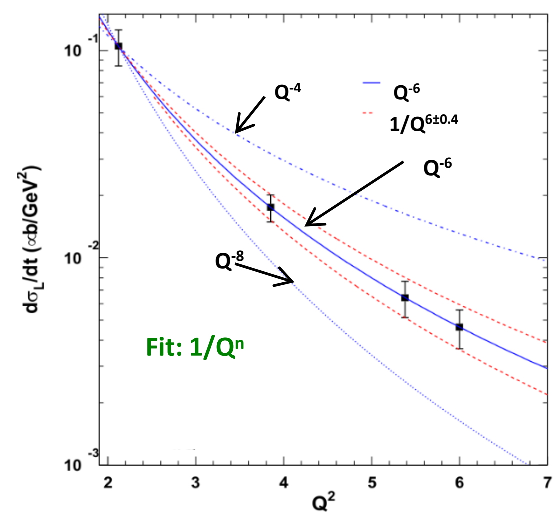
Goals

- Reliable pion form factor extractions to the highest possible Q^2
- Validation of pion form factor extractions at the highest Q^2
- Separated cross sections as a function of Q^2 at fixed x=0.3, 0.4, 0.55 to validate the reaction mechanism towards 3D imaging studies



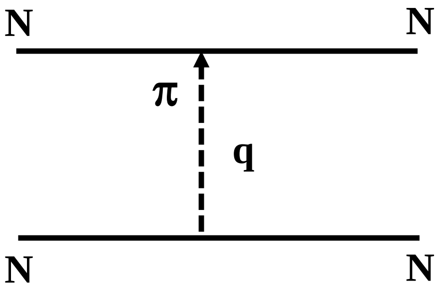
Overview of major changes since approval

- Low energy kinematics run summer 2019 – going on now!
- Developed a combined and optimized run plan for measuring separated π^+ cross sections over a range of Q^2, x and t, enabling pion form factor extractions
- Considerable theory efforts over the last years – need separated pion electroproduction cross section data to make progress



Background: Pions are of particular Importance

- The pion is responsible for the long-range part of the nuclear force, acting as the basis for meson exchange forces and playing a critical role as an elementary field in nuclear structure Hamiltonians



We exist because Nature has supplied two light quarks that combine to form the pion, which is unnaturally light and so easily produced

- As the lightest meson, it must be a valence $q\bar{q}$ bound state, but understanding its structure through QCD has been exceptionally challenging
  - *e.g.*, with constituent quarks Q: in the nucleon $m_Q \sim ⅓m_N \sim 310$ MeV, in the pion $m_Q \sim ½m_\pi \sim 70$ MeV, in the kaon (with one s quark) $m_Q \sim 200$ MeV – **This is not real**.
  - The mass of bound Goldstone boson states increases as √m with the mass of the constituents
  - In both DSE and LQCD, the mass function of quarks is the same, regardless what hadron the quarks reside in – **This is real**. It is the Dynamical Chiral Symmetry Breaking (DχSB) that makes the pion and kaon masses light.

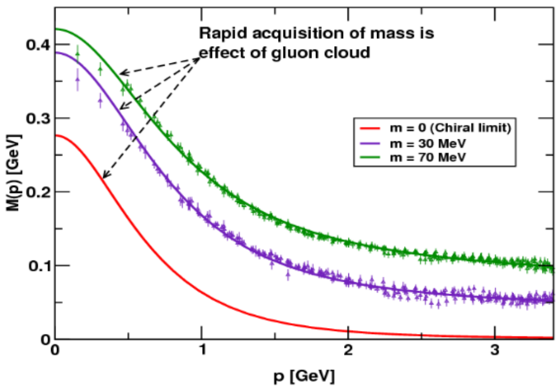
$$f_\pi m_\pi^2 = \left(m_u^\zeta + m_d^\zeta\right)\rho_\pi^\zeta$$
$$f_K m_K^2 = \left(m_u^\zeta + m_s^\zeta\right)\rho_K^\zeta$$

Exact statements from QCD in terms of current quark masses in chiral limit

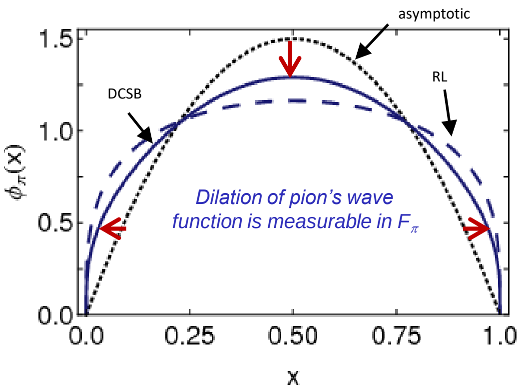
Review Scientific Motivation: Form Factors

- ***Pion and kaon form factors*** are of special interest in hadron structure studies
  - The *pion* is the lightest QCD quark system and also has a central role in our understanding of the dynamic generation of mass

    Clearest test case for studies of the transition from non-perturbative to perturbative regions



- Recent advances and future prospects in experiments
  - Dramatically improved precision in F_π measurements



- Experimental development has been matched by theoretical and computational advances
  - QCD calculations within DSE framework describe how quarks acquire momentum-dependent mass
  - Increasingly precise calculations of PDFs and distribution amplitudes

Review Scientific Motivation: 3D Hadron Structure

- After decades of study of the partonic structure of the nucleon we now have the experimental and theoretical tools to systematically move beyond a 1D momentum fraction picture of the nucleon
  - High luminosity, high resolution experiments combined with large acceptance experiments, polarized beams and targets
  - Theoretical description of the nucleon in term of 5D Wigner distribution that can be used to encode both 3D momentum and transverse spatial distributions
- Deep Exclusive Scattering cross sections give sensitivity to electron-quark scattering off quarks with longitudinal momentum fraction *x* at transverse location *b*
  - Validation of the hard-exclusive reaction mechanism is essential – the key is precision longitudinal-transverse (L/T) separated data over a range of Q^2 at fixed x/t

- **PAC32: "A detailed study to determine whether or not meson electroproduction can provide information on GPDs is important." and "Discussion of this proposal clarified the theoretical basis for GPD studies ... even if σ_T is found not to be small,..., the separation of σ_L may be sufficient for investigating GPDs."**
- **If σ_T is confirmed to be large, it could allow for detailed investigations of transversity GPDs. If, on the other hand, σ_L is measured to be large, this would allow for probing the usual GPDs**

PionLT Publications – based on two 6 GeV pion experiments

~2000

6 GeV Pion Experiments:
1997 (phase 1)
2003 (phase 2)

- J. Volmer, et al., Phys. Rev. Lett. **86** (2001) 1713 – **302 citations**
  - Precision F_π results between Q^2=0.60 and 1.60 GeV^2
- T. Horn, D. Gaskell, G. Huber, et al., Phys. Rev. Lett. **97** (2006) 192001 – **232 citations**
  - Precision F_π results at Q^2=1.60 and 2.45 GeV^2
- V. Tadevosyan, et al., Phys. Rev. C**75** (2007) 055205 – **199 citations**
- G. Huber, T. Horn, D. Gaskell, et al., Phys. Rev. C**78** (2008) 045203 – **172 citations**
  - Archival paper of precision F_π measurements at JLab 6 GeV
- G. Huber, T. Horn, D. Gaskell, et al., Phys. Rev. C**78** (2008) 045202 – **99 citations**
  - Archival paper of precision LT separated pion cross sections at JLab 6 GeV
- T. Horn, D. Gaskell, G. Huber, et al., Phys. Rev. C**78** (2008) 058201 – **61 citations**
  - L/T cross sections and F_π at Q^2=2.15 GeV^2 ,exploratory at Q^2~4.0 GeV^2
- Plus several spin-off papers on, e.g. L/T separations in π^- and ω production, high-t (2012-present)

2019

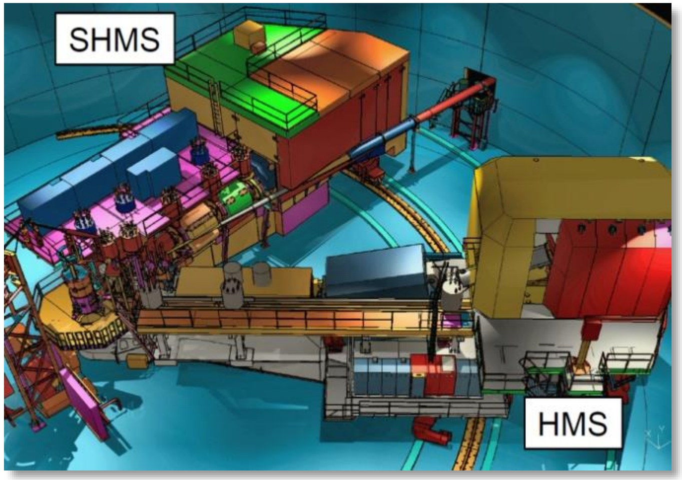
Exclusive Pion Experiments in Hall C

The JLab 6 GeV π^+ experiments:

- Made considerable contributions to commissioning spectrometers and data analysis for high precision cross section measurements – Phys. Rev. C archival paper

The JLab 12 GeV π^+ experiments:

- ***E12-06-101***: determine F_π up to Q^2=6 GeV^2 in a dedicated experiment
  - Require t_{min}<0.2 GeV^2 and $\Delta\varepsilon$>0.25 for L/T separation
  - Approved for 52 PAC days with "A" rating, high impact
- ***E12-07-105***: probe conditions for factorization of deep exclusive measurements in π^+ data to highest possible Q^2~9 GeV^2 with SHMS/HMS
  - Potential to extract F_π to the highest Q^2~9GeV^2 achievable at Jlab 12 GeV
  - Approved for 36 PAC days with "A-" rating

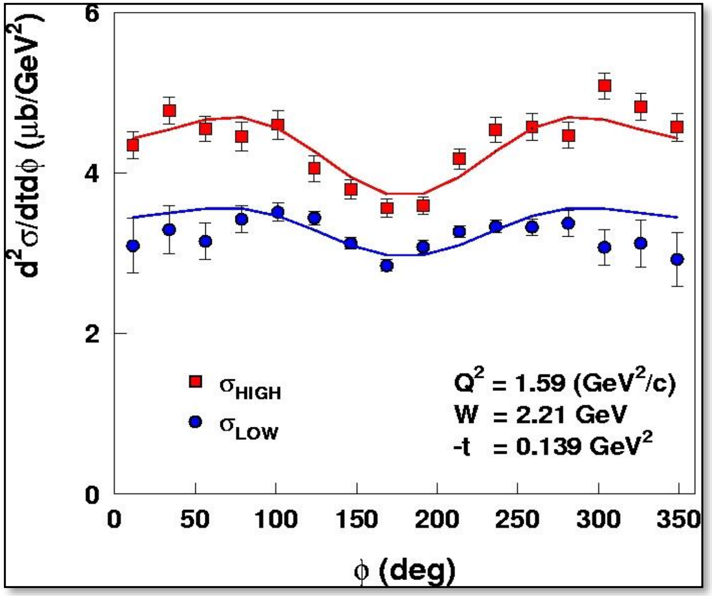


The 12 GeV pion experiments requirements greatly influenced design specs of the new SHMS

- Small forward angles
- Good angular reproducibilty
- Missing mass resolution

L/T Separation Example

- σ_L is isolated using the Rosenbluth separation technique → See also Richard Trotta's talk on Friday
  - Measure the cross section at two beam energies and fixed W, Q^2, -t
  - Simultaneous fit using the measured azimuthal angle (ϕ_π) allows for extracting L, T, LT, and TT
- Careful evaluation of the systematic uncertainties is important due to the $1/\varepsilon$ amplification in the σ_L extraction
  - Spectrometer acceptance, kinematics, and efficiencies



$$2\pi \frac{d^2\sigma}{dt\,d\phi} = \varepsilon \frac{d\sigma_L}{dt} + \frac{d\sigma_T}{dt} + \sqrt{2\varepsilon(\varepsilon+1)}\frac{d\sigma_{LT}}{dt}\cos\phi + \varepsilon\frac{d\sigma_{TT}}{dt}\cos 2\phi$$

σ_L will give us F_π

Magnetic spectrometers a must for such precision cross section measurements

- This is only possible in Hall C at JLab

Extraction of F_π from σ_L Jlab data

- JLab 6 GeV F_π experiments used the VGL/Regge model as it has proven to give a reliable description of σ_L across a wide kinematic domain

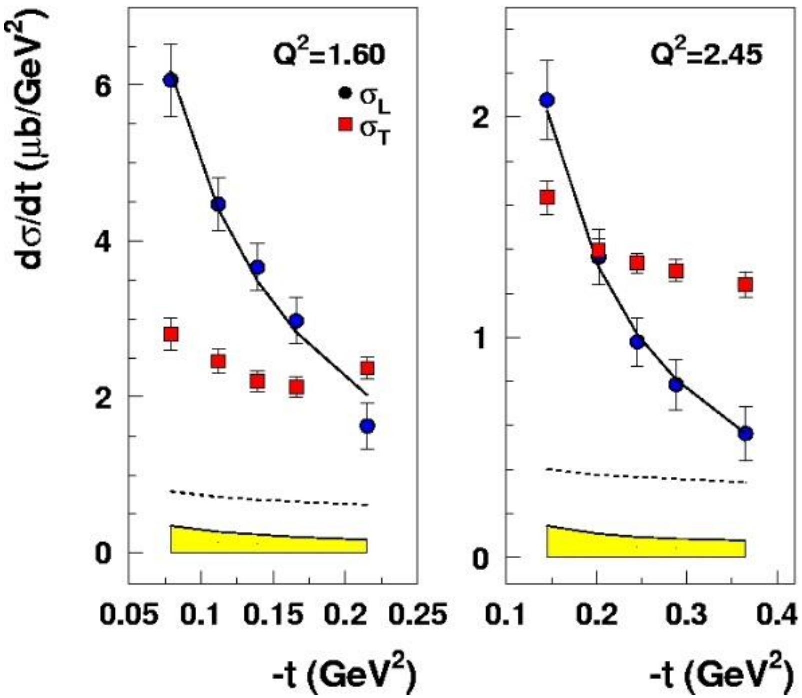
  *[Vanderhaeghen, Guidal, Laget, PRC **57**, (1998) 1454]*

  - Feynman propagator replaced by π and ρ trajectories
  - Model parameters fixed by pion photoproduction data
  - Free parameters: $\Lambda_\pi^2, \Lambda_\rho^2$

$$F_\pi(Q^2) = \frac{1}{1+Q^2/\Lambda_\pi^2}$$

Fit of σ_L to model gives F_π at each Q^2

*[Horn et al., PRL **97**, (2006) 192001]*



$$\Lambda_\pi^2 = 0.513,\ 0.491\ GeV^2$$

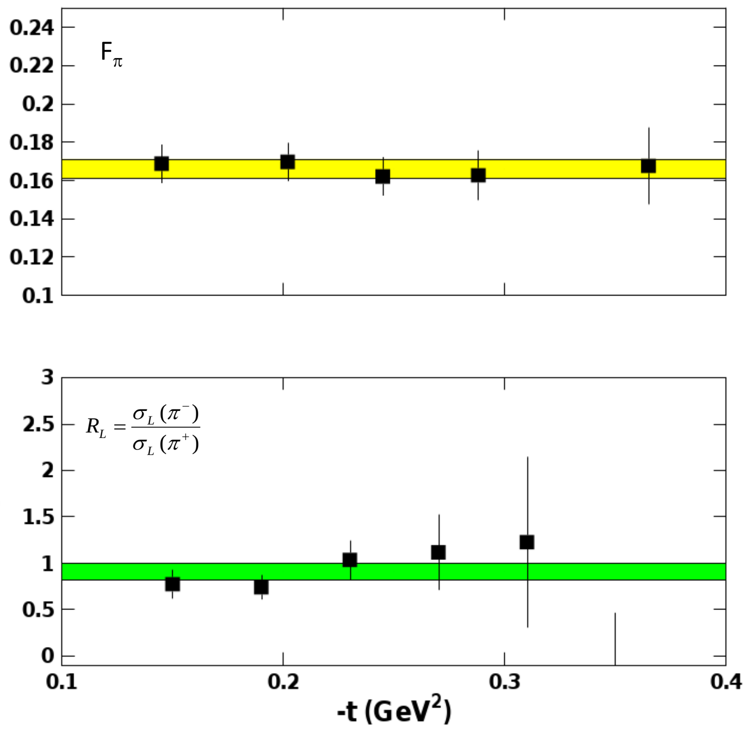
$$\Lambda_\rho^2 = 1.7\ GeV^2$$

Experimental Considerations

Experimental studies over the last decade have given more *confidence* in the electroproduction method yielding the physical pion form factor

Experimental studies include:

- Check consistency of model with data
  - F_π values seem robust at larger -t (>0.2) – increased confidence in applicability of model to the kinematic regime of the data
- Verify that the pion pole diagram is the dominant contribution in the reaction mechanism
  - R_L (= $\sigma_L(\pi^-)/\sigma_L(\pi^+)$) approaches the pion charge ratio, consistent with pion pole dominance
- Extract F_π at several values of t_{min} for fixed Q^2 (not shown here)



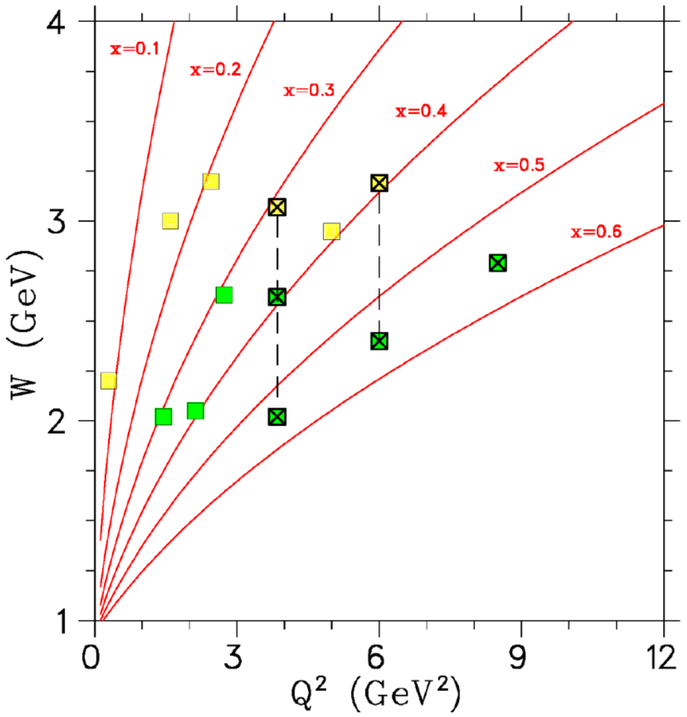
$$R_L = \frac{\sigma(n(e,e'\pi^-)p)}{\sigma(p(e,e'\pi^+)n))} = \frac{|A_v - A_s|^2}{|A_v + A_s|^2}$$

Optimization of two experiments into one program

- An optimization of the kinematics of E12-06-101 and E12-07-105 now allows to extend pion form factor data to the highest possible Q^2 achievable at 12 GeV JLab

JLab 12 GeV F_π Program features:

- Reliable F_π extractions from existing data to the highest possible Q^2
- Validation of F_π extraction at highest Q^2
- Separated cross sections as function of Q^2 at fixed x=0.3, 0.4, 0.55

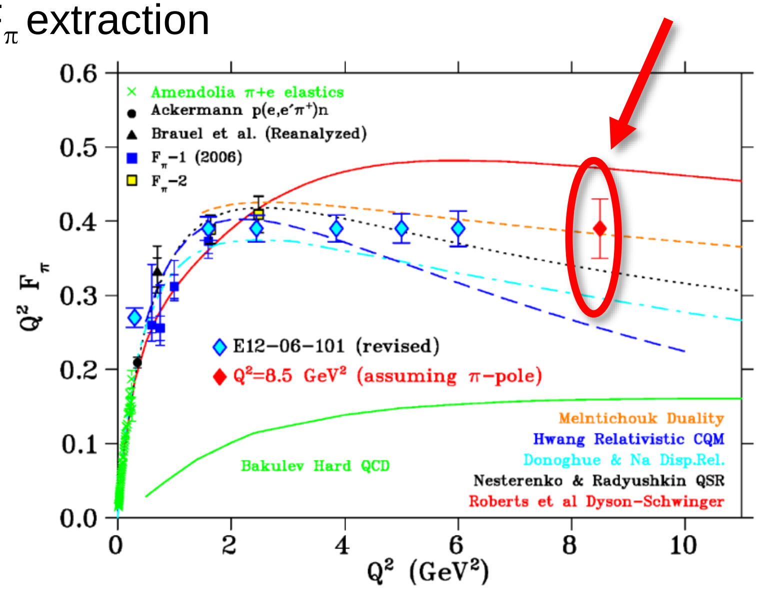


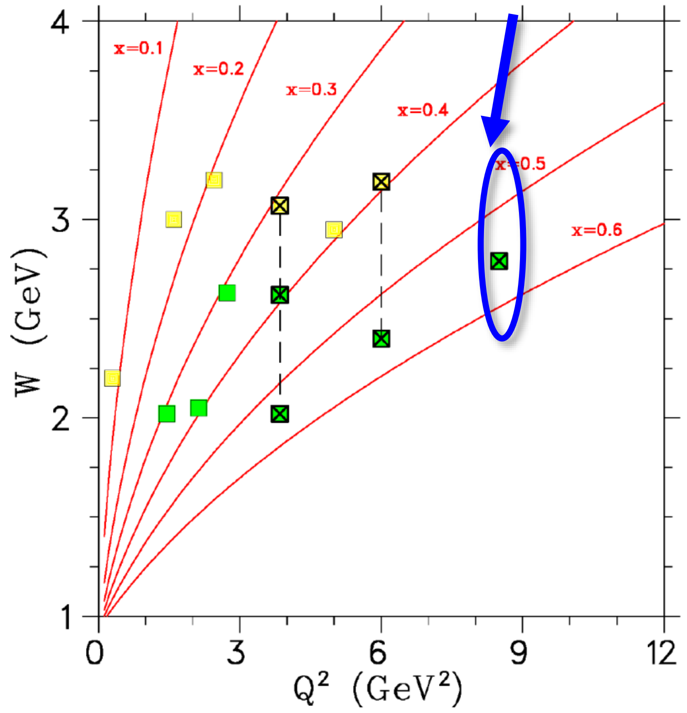
- The optimized program also addresses several points raised by previous PACs

Justification of the beam time for the highest x/Q^2 point (PAC32)

Moved the previous E12-07-105 point at Q^2=9.1 GeV^2 to Q^2=8.5 GeV^2 to extend F_π extraction to the highest possible Q^2 at JLab 12 GeV

- Benefits from reduced uncertainties due to higher rate and more favorable $\Delta\varepsilon$ magnification
- Some beam time added for statistics needed for F_π extraction



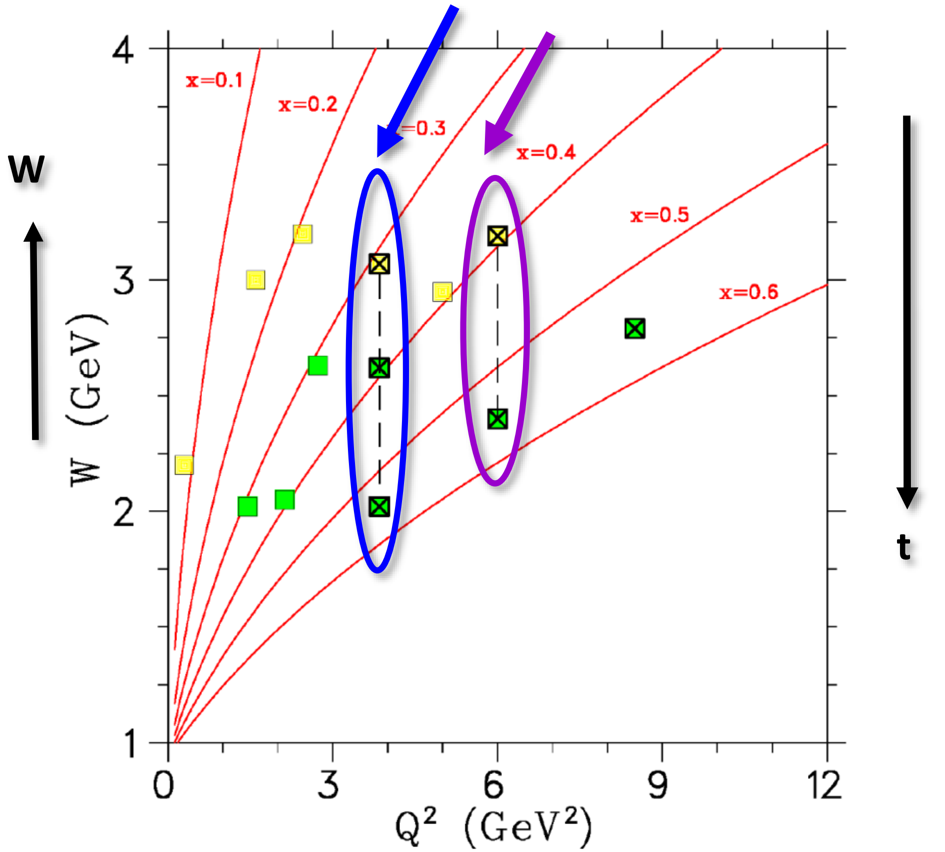


Potential physics outcome justifies the beam time requirement

Optimization between the two experiments (PAC32)

To achieve better overlap between the two experiments, move Q^2=6.6 point of E12-07-105 to 6.0 GeV^2 and re-arrange intermediate points to common Q^2=3.85 GeV^2

- t-scans at fixed Q^2
  - Q^2=3.85 GeV^2
    - t_{min}=0.12, 0.21, 0.49 GeV^2
  - Q^2=6.0 GeV^2
    - t_{min}=0.21, 0.53 GeV^2

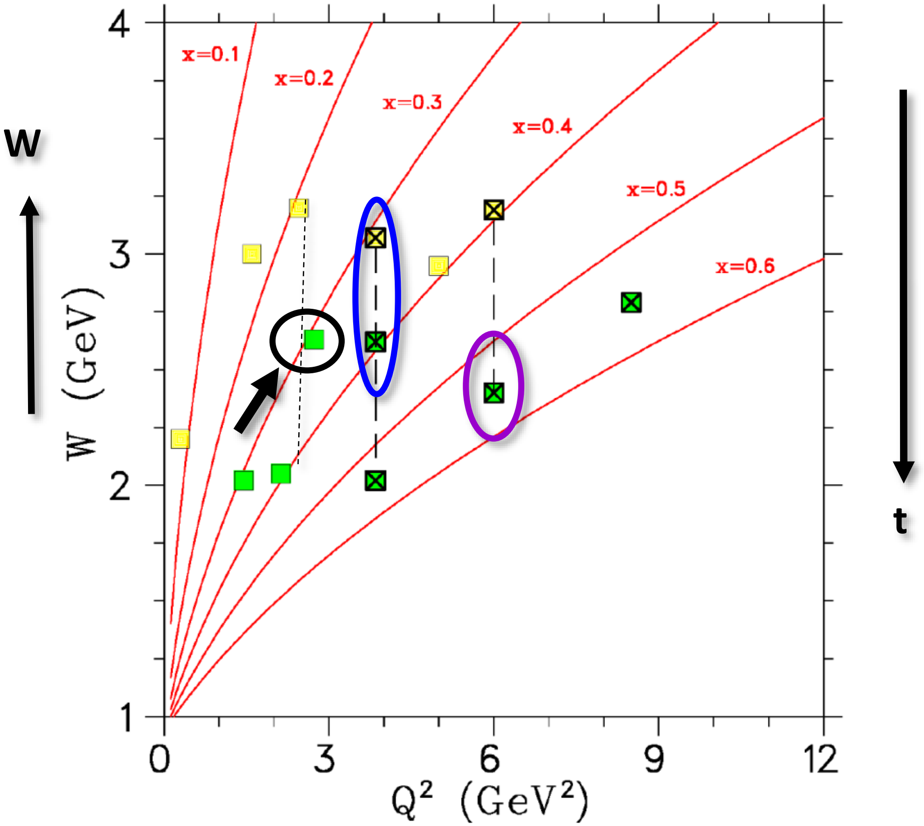


Note: W increases as t decreases

Optimization between the two experiments (PAC32)

To achieve better overlap between the two experiments, move Q^2=6.6 point of E12-07-105 to 6.0 GeV^2 and re-arrange intermediate points to common Q^2=3.85 GeV^2

- t-scans at fixed Q^2
  - Q^2=3.85 GeV^2
    - t_{min}=0.12, 0.21, 0.49 GeV^2
  - Q^2=6.0 GeV^2
    - t_{min}=0.21, 0.53 GeV^2
  - Q^2=2.12 GeV^2
    - t_{min}=0.20 GeV^2

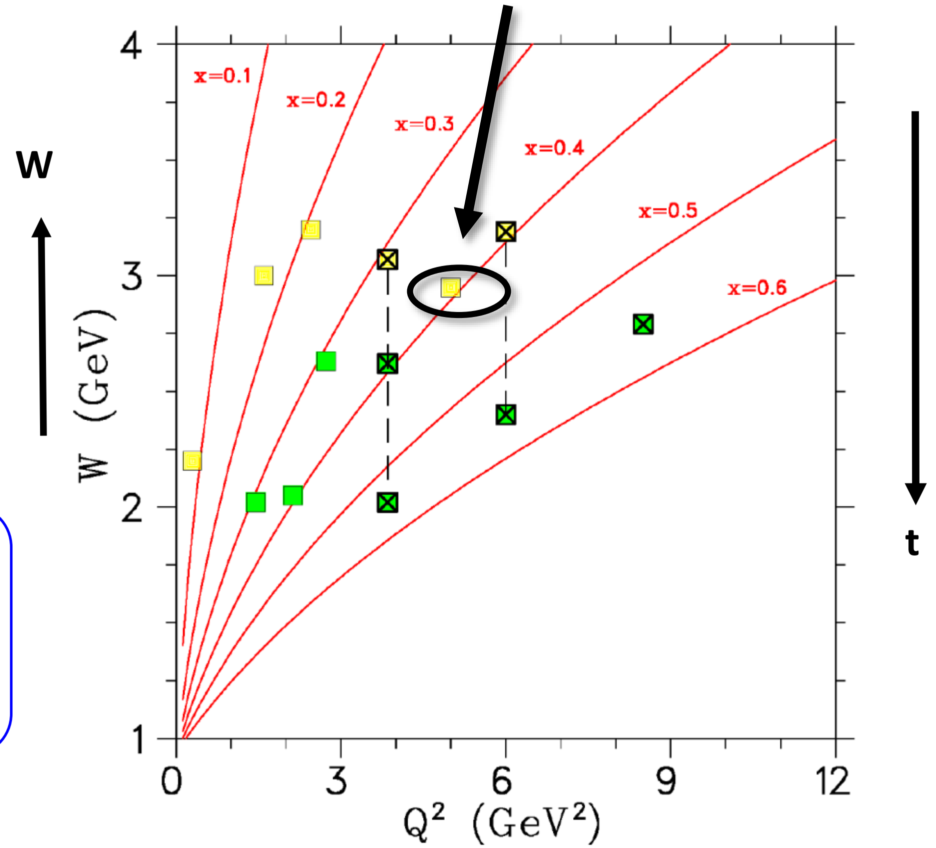


Note: W increases as t decreases

Optimization of the schedule (PAC30)

Considerable time saved by eliminating points at Q^2=4.46 GeV^2 (E12-06-101) and Q^2=5.5 GeV^2 (E12-07-105) – moved Q^2=5.25 GeV^2 point of E12-06-101 to Q^2=5.0 GeV^2 to also serve in x-scan

- Additional optimizations:
  - Revised all settings to minimize the number of settings requiring special Linac gradients
  - Reduced the most forward angle requirements
  - Increased target cell length from 8 cm to 10 cm allowing for reduction in max beam current from 85 μA (with 8 cm target assumed for PAC35/38) to 70μA.



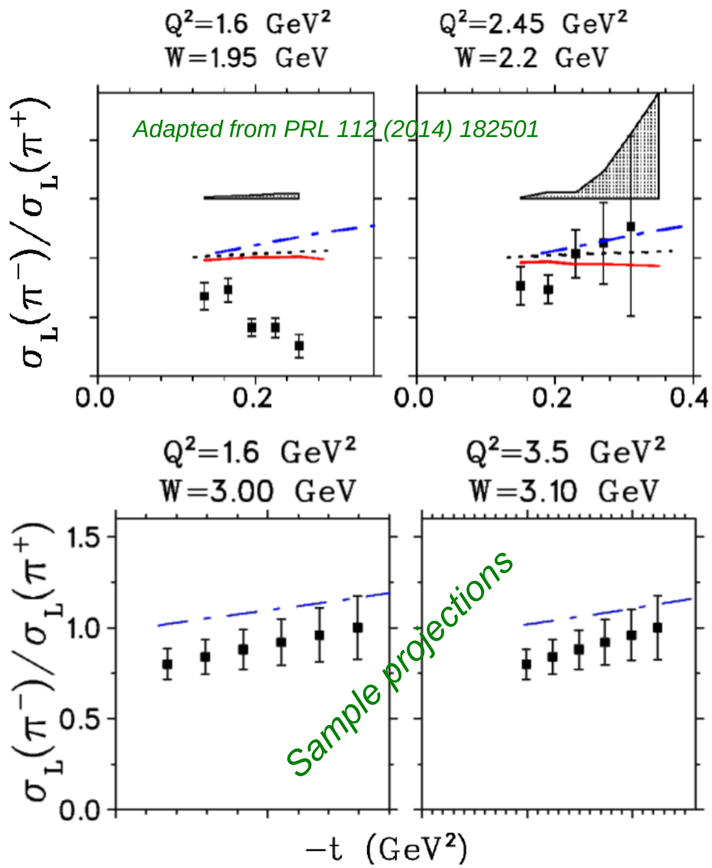
Note: W increases as t decreases

Method check: validation of the F_π extraction

- Check consistency of model with data

- Extract F_π **at several values of t_{min}** for fixed Q^2
  - at Q^2=3.85 and 6.00 GeV^2 (and 2.12 GeV^2)
  - Combining with 6 GeV data - at Q^2=1.6 and 2.45 GeV^2

- Verify that the pole diagram is the dominant contribution in the reaction mechanism
  - **L/T separated π^-/π^+ ratios** to validate form factor extraction at Q^2=1.6, 3.85, and 6.0 GeV^2



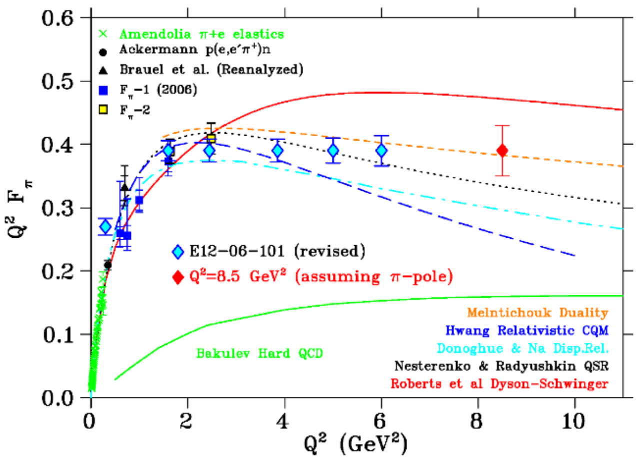
$$R_L = \frac{\sigma(n(e,e'\pi^-)p)}{\sigma(p(e,e'\pi^+)n))} = \frac{|A_v - A_s|^2}{|A_v + A_s|^2}$$

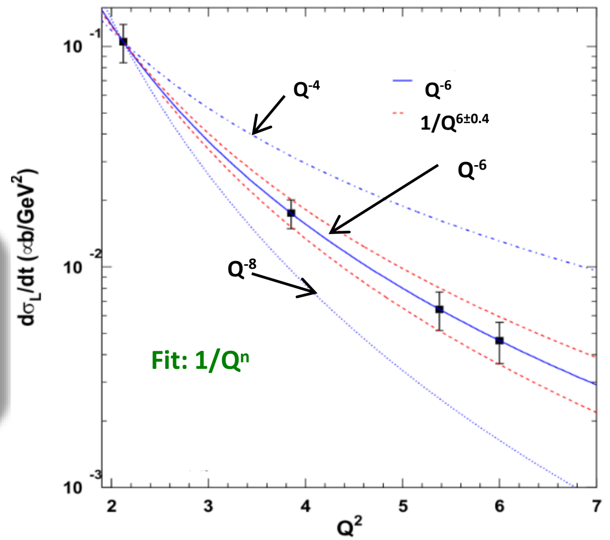
Summary PionLT Program at 12 GeV

- Started data taking this summer – running now!
- Enables measurements of pion form factor at low t up to Q^2 = 6 GeV^2
- Allows for measurements of the separated π^+ cross sections as function of Q^2 at three fixed values of x
- Enables pion form factor measurement to the very largest Q^2 accessible at 12 GeV JLab, 8.5 GeV^2

A comprehensive and coherent program of charged pion electroproduction, L/T-separated cross section measurements

F_π measurement at Q^2=8.5 GeV^2 will contribute greatly to our understanding of QCD





Optimized settings for both experiments

Running summer 2019

Used for both FF and reaction mechanism validation, as well as validation FF extraction at high t

FF extraction at high Q^2

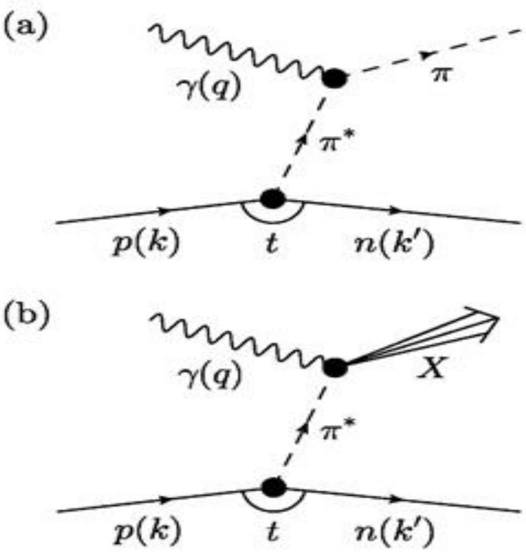
Q^2	W	x	$-t_{min}$	Type	E_e	ε	θ_q	$\theta_{\pi q}$	Hrs
0.38	2.20	0.087	0.008	LH+	2.8	0.286	5.70	0, +2, +4°	11.1
					3.7	0.629	8.87	-2, 0, +2, +4°	14.8
					4.6	0.781	10.33	-4, -2, 0, +2, +4°	18.5
1.60	3.00	0.165	0.029	LH+	6.7	0.408	6.36	0, +2°	9.9
					8.8	0.689	8.70	-2, 0, +2°	12.8
					11.0	0.817	9.91	-2, 0, +2°	12.8
1.60	3.00	0.165	0.029	LD+	6.7	0.408	6.36	0, +2°	9.9
					11.0	0.817	9.91	-2, 0, +2°	12.8
1.60	3.00	0.165	0.029	LD-	6.7	0.408	6.36	0, +2°	18.7
					11.0	0.817	9.91	-2, 0, +2°	12.8
2.45	3.20	0.208	0.048	LH+	8.0	0.383	6.26	0, +2°	9.9
					8.8	0.505	7.30	-1.8, 0, +2°	12.8
					11.0	0.709	9.03	-2, 0, +2°	12.8
3.85	3.07	0.311	0.120	LH+	8.0	0.301	6.53	-1.03, 0, +2°	33.5
					8.8	0.436	7.97	-2, 0, +2°	18.2
					9.9	0.572	9.31	-2, 0, +2°	13.3
					11.0	0.666	10.27	-2, 0, +2°	12.8
3.85	3.07	0.311	0.120	LD+	8.0	0.301	6.53	-1.03, 0, +2°	33.5
					11.0	0.666	10.27	-2, 0, +2°	12.8
3.85	3.07	0.311	0.120	LD-	8.0	0.301	6.53	0, +2°	118.8
					11.0	0.666	10.27	-2, 0, +2°	12.8
5.00	2.95	0.390	0.209	LH+	8.0	0.238	6.35	0, +2°	74.5
					9.9	0.530	9.76	-2, 0, +2°	41.1
					11.0	0.633	10.88	-2, 0, +2°	27.0
6.00	3.19	0.392	0.214	LH+	9.2	0.184	5.13	0.37, +2°	182.2
					9.9	0.304	6.64	0, +2°	80.6
					11.0	0.452	8.22	-2, 0, +2°	71.9
Calibrations									80.0
Beam Energy Changes									72.0
Total Hours (100% efficiency)									1054.6
PAC35 Approved Hours (100% efficiency)									1248.0
Time Saved: 1248-1054.6 hrs (100% efficiency)									-193.4

Q^2	W	x	$-t_{min}$	Type	E_e	ε	θ_q	$\theta_{\pi q}$	Hrs
1.45	2.02	0.312	0.114	LH+	3.7	0.511	13.76	-2, 0, +2°	11.1
					6.7	0.880	20.17	-2, 0, +2°	10.0
2.73	2.63	0.311	0.118	LH+	6.7	0.513	10.30	-2, 0, +2°	13.8
					11.0	0.845	14.58	-2, 0, +2°	9.3
2.12	2.05	0.390	0.195	LH+	4.6	0.573	15.14	-2, 0, +2°	11.1
					8.8	0.907	21.44	-2, 0, +2°	12.8
3.85	2.62	0.392	0.208	LH+	6.7	0.360	8.94	-2, 0, +2°	22.5
					11.0	0.799	14.58	-2, 0, +2°	9.6
3.85	2.62	0.392	0.208	LD+	6.7	0.360	8.94	-2, 0, +2°	22.5
					11.0	0.799	14.58	-2, 0, +2°	9.6
3.85	2.62	0.392	0.208	LD-	6.7	0.360	8.94	-2, 0, +2°	74.9
					11.0	0.799	14.58	-2, 0, +2°	9.6
3.85	2.02	0.546	0.487	LH+	6.0	0.582	17.41	-2, 0, +2°	9.6
					11.0	0.898	21.92	-2, 0, +2°	9.6
6.00	2.40	0.551	0.530	LH+	8.0	0.449	11.26	-2, 0, +2°	48.5
					11.0	0.738	15.31	-2, 0, +2°	18.4
6.00	2.40	0.551	0.530	LD+	8.0	0.449	11.26	-2, 0, +2°	48.5
					11.0	0.738	15.31	-2, 0, +2°	18.4
6.00	2.40	0.551	0.530	LD-	8.0	0.449	11.26	-2, 0, +2°	48.5
					11.0	0.738	15.21	-2, 0, +2°	18.4
8.50	**2.79**	**0.552**	**0.550**	**LH+**	**9.2**	**0.156**	**5.52**	**0°**	**388.0**
					11.0	**0.430**	**9.36**	**0°**	**108.5**
Calibrations									48.0
Extra calibrations needed for large angle *ytar*									8.0
Beam energy changes									72.0
Total Hours (100% efficiency)									1057.3
PAC38 Approved Hours (100% efficiency)									864.0
Extra time: 1035.3-864.0 (Table I) hrs (100% efficiency)									+193.5

E12-06-101 **E12-07-105**

The role of the pion cloud

- The **Sullivan process can provide reliable access to a meson target** as t becomes space-like if the pole associated with the ground-state meson remains the dominant feature of the process and the structure of the related correlation evolves slowly and smoothly with virtuality.



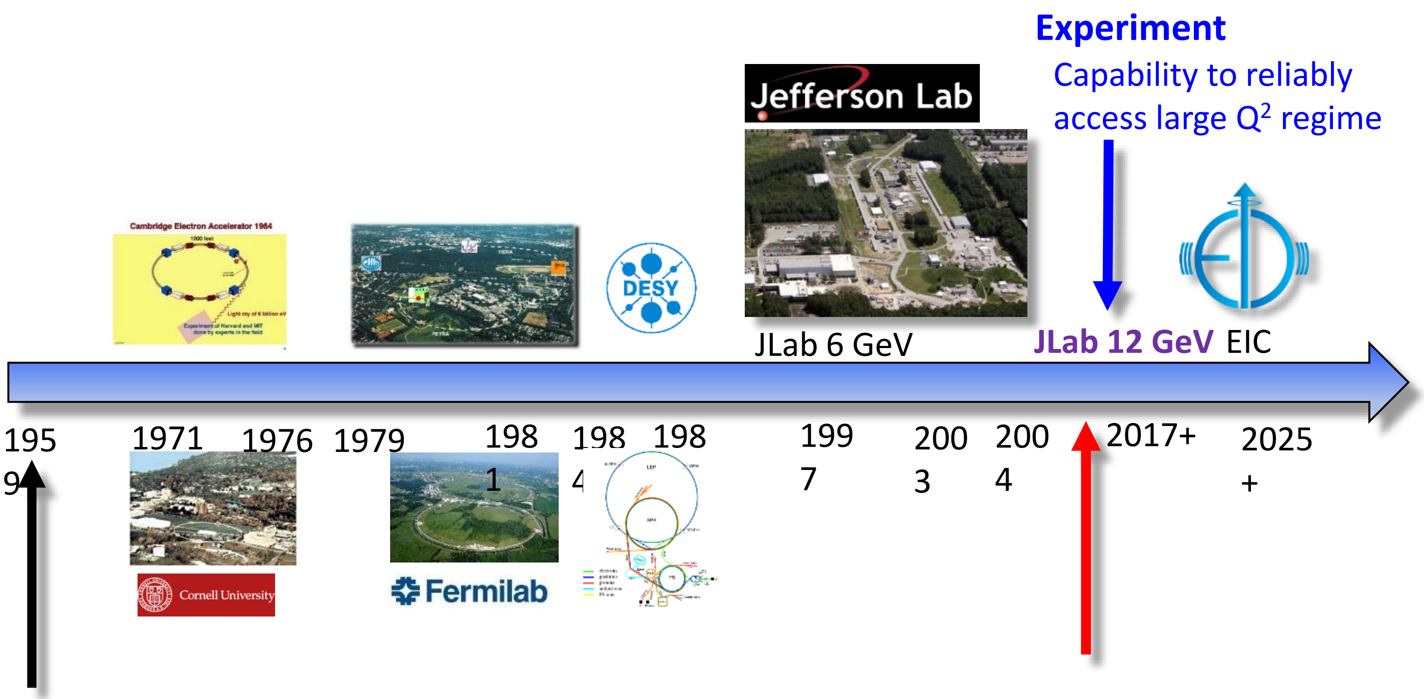
- To **check these conditions** are satisfied empirically, one can **take data covering a range in *t*** and compare with phenomenological and theoretical expectations.

- Recent **theoretical calculations found that for -t ≤ 0.6 GeV²**, **all changes in pion structure are modest** so that a well-constrained experimental analysis should be reliable Similar analysis for the kaon indicates that Sullivan processes can provide a valid kaon target for -t ≤ 0.9 GeV²

Sullivan processes. In these examples, a nucleon's pion cloud is used to provide access to the pion's (a) elastic form factor and (b) parton distribution functions. $t = -(k-k')^2$ is a Mandelstam variable and the intermediate pion, $\pi^*(P=k-k')$, $P^2= -t$, is off-shell.

S.-X. Qin, C. Chen, C. Mezrag and C. D. Roberts, Phys. Rev. C 97 (2018) 015203.

Meson Form Factor Data Evolution



Theory

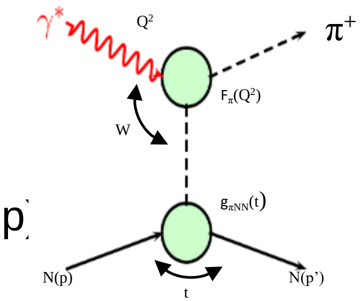
- Accessing the form factor through electroproduction
- Extraction of meson form factor from data
- Electroproduction formalism

Theory

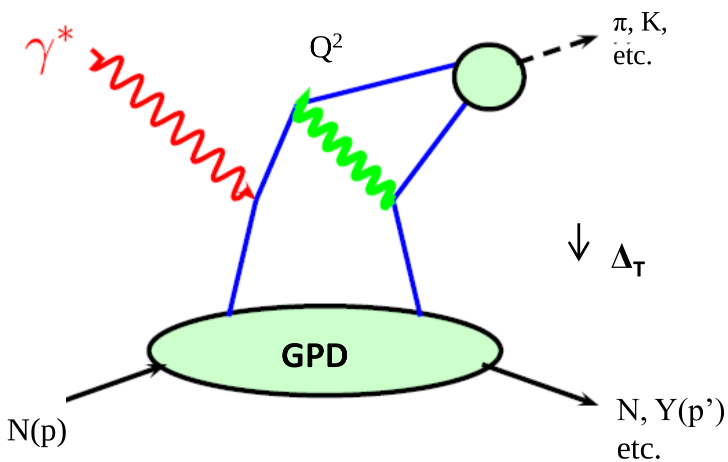
Major progress on large Q^2 behavior of meson form factor

Towards GPD flavor decomposition: DVMP

- ❑ Relative contribution of σ_L and σ_T to cross section are of great interest for nucleon structure studies



- ➢ described by 4 (helicity non-flip) GPDs:
  - –*H, E* (unpolarized), $\tilde{H}$, $\tilde{E}$ (polarized)
- ➢ Quantum numbers in DVMP probe individual GPD components selectively
  - –Vector : ρ^o/ρ+/*K** select *H, E*
  - **–Pseudoscalar: π,η,*K* select the polarized GPDs**
- ➢ Reaction mechanism can be verified experimentally - **L/T separated cross sections to test QCD Factorization**



- ❑ Recent calculations suggest that leading-twist behavior for light mesons may be reached at Q^2=5-10 GeV^2
- ❑ JLab 12 GeV can provide experimental confirmation in the few GeV regime

Selection of recent work – based on 6 GeV JLab

2019

- P. Kroll, “Hard exclusive processes involving kaons”, Eur. Phys. J. A**55** (2019) no. 5, 76
- *M. Carmignotto et al., “Separated Kaon Electroproduction cross section and the kaon form factor from 6 GeV Jlab data”, Phys. Rev. C**97** (2018) no. 2, 025204*
- S.X. Qin, C. Chen, C. Mezrag, C.D. Roberts, “Off-shell persistence of composite pions and kaons”, Phys. Rev. C**97** (2018) no. 1, 0152203
- T. Horn, C.D. Roberts, “The pion: an enigma within the Standard Model”, J. Phys. G**43** (2016) no.7, 073001
- L. Favart, M. Guidal, T. Horn, P. Kroll, “Deeply Virtual Meson Production on the nucleon”, Eur. Phys. J. A**52** (2016) no. 6, 158
- *M. Defurne et al., “Rosenbluth separation of the p0 electroproduction cross section”, Phys. Rev. Lett.**117** (2016) no. 26, 262001*
- G.R. Goldstein, J. Osvaldo Hernandez, S. Liuti, “Flexible Parameterization of GPDs: The Chiral Odd Sector”, Phys. Rev. D**91** (2015) no.11, 114013
- S.V. Goloskokov, P. Kroll, “The pion pole in hard exclusive vector-meson leptoproduction”, Eur. Phys. J. A**50** (2014) no. 9, 146
- S.V. Goloskokov, P. Kroll, “Transversity in exclusive vector-meson leptoproduction”, Eur. Phys. J. C**74** (2014) 2725
- M. Carmignotto, T. Horn, G.Miller, “Pion transverse charge density and the edge of hadrons”, Phys. Rev.. C**90** (2014)
- S. Liuti, G.R. Goldstein, J. Osvaldo Hernandez, K. Kathuria, “Chiral odd GPDs from exclusive p0 electroproduction”, Nuovo Cim. C**036** (2013) no.05, 121
- P. Kroll, H. Moutarde, F. Sabatie, “From hard exclusive electroproduction to deeply virtual Compton Scattering”, Eur. Phys. J. C**73** (2013) no. 1, 2278

~2011 (PAC38)

- S.V. Goloskokov, P. Kroll, “Transversity in hard exclusive electroproduction of pseudoscalar mesons”, Eur. Phys. J. A**47** (2011) 112

Previous PAC comments

PAC30

Issues: Since the measurement requires a large number of measurements at different energy and spectrometer settings, a careful optimization of the schedule is strongly recommended. The use of a longer target envisaged in the proposal requires a proper understanding of the corresponding variation in the acceptance. This does not look an issue since the simulated variation is smooth. On the other hand a longer target, but not beyond 10 cm, may allow a reduction in the beam current that could be a benefit for operation in other halls. Given the delicate nature of acceptance issues in Rosenbluth separations that require adequate understanding of the spectrometer performance, it is clear and acknowledged by the proponents that the experiment could only run after an adequate commissioning of the new SHMS.

PAC32

Issues: A detailed study to determine whether or not meson electroproduction can provide information on GPDs is important. The PAC believes that the kinematics might not be fully optimized. The experiment could better overlap the F_π-experiment. The collaboration should consider whether the highest x / Q^2 point fully justifies the large time required.