

(1) Overview of experiment: E12-09-011

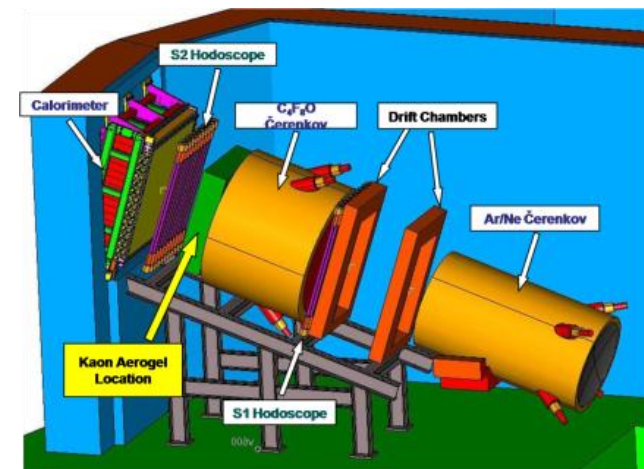
Present an overview of the experiment. As we have a PAC that assigns grades, don't try to sell the importance of the physics. But do point out if the physics result is a prerequisite to other JLab experiments that may run early in the 12 GeV era. Clearly indicate if the experiment should be considered as a possible "commissioning" experiment (first two), or "early" experiment (roughly first five, including the two commissioning).

- Measure the separated cross section of K^+ electroproduction above the resonance region over a wide range of Q^2
 - Separated cross sections: L, T, LT, TT, t-dependence
- The charged kaon L/T ratio is of significant interest to the study of GPDs at 12 GeV, i.e., one of the key 12 GeV programs at JLab
 - No knowledge whatsoever when strangeness is at play
- Relatively fast measurement and clean L/T separation before starting large endeavor on entire phase space
 - 36+4 days to provide the first L/T separated kaon data above the resonance region
 - Least demanding L/T separation in terms of systematics
- Excellent candidate for **early running**
 - Note: At 6 GeV kaon experiments were #4 and #5 and a similar order should be considered here

(2) Contribution of Experiment Collaboration

Note the contributions that your experiment's collaboration is making toward the construction/commissioning of the SHMS and the recommissioning of Hall C.

- Catholic University of America is leading an MRI consortium (NSF PHY-1039446) for construction of a kaon identification system for SHMS
 - Consortium members: CUA, USC, MSU, FIU, Alikhanyan NL, Jlab
- University of Regina is building the SHMS Heavy Gas Cerenkov
 - In collaboration with Hall C scientific and technical staff
- Yerevan group is building the SHMS calorimeter
 - Lead role in construction of the HMS aerogel detector
- James Madison and Hampton groups are part of a consortium building the tracking and trigger detectors
 - Consortium members: W&M, JMU, NC A&T, HU



(3) Collaboration's openness to invite additional hall users and staff

Because of the additional manpower and expertise likely needed for for commissioning experiments, discuss your collaboration's openness to inviting additional hall users and staff to participate in the experiment.

E12-09-011 Collaboration (as of PAC38):

P. Bosted, S. Covrig, H. Fenker, R. Ent, D. Gaskell T. Horn* M. Jones,
J. LeRose, D. Mack, G.R. Smith, S. Wood G. Huber A. Semenov,
Z. Papandreou, W. Boeglin, P. Markowitz B. Raue, J. Reinhold, F. Klein,
. Nadel-Turonski, A. Asaturyan, A. Mkrtchyan, H. Mkrtchyan, V. Tadevosyan,
D. Dutta, M. Kohl, P. Monaghan, L. Tang, D. Hornidge, A. Sarty,
E. Beise, G. Niculescu, I. Niculescu, K. Aniol, E. Brash, V. Punjabi,
C. Perdrisat, Y. Ilieva, F. Cusanno, F. Garibaldi, M. Iodice, S. Marrone,
P. King, J. Roche

*JLab, CUA, Regina, FIU, Yerevan, Mississippi, Hampton, Mount Allison, Saint Mary's, UMd,
JMU, California State, CNU, Norfolk, W&M, South Carolina, INF, Ohio*

Not on list and would like to join? - Please contact: T. Horn (hornt@jlab.org)



(4) Readiness to run experiment early

Discuss the collaboration's readiness (manpower, hardware, software, commitment to a tight schedule, past experience/track record, ...) to run the experiment early.

- Collaboration has extensive experience since this is the third generation of L-T separated meson production experiments in Hall C.
 - Using the familiar HMS for electrons and SHMS for kaons
- Large fraction of collaboration ran kaon experiments at 6 GeV, which were early experiments as well
- The collaboration is building a kaon detection system supported by NSF MRI 1039446 to carry out the strangeness physics program in Hall C
 - The detector construction is on schedule and will be ready for the 12 GeV era
- FIU has committed to working on SHMS commissioning as well as the software and data acquisition upgrades
 - FIU has considerable experience with Hall C (SOS!) and Hall A spectrometer commissioning and software for analysis

(5) Running with a new not yet well understood spectrometer

Discuss the features of your experiment that make it conducive to running with a new not yet well understood spectrometer and new accelerator. Conversely, list special unusual/difficult requirements, such as unusual target demands, tight resolution and efficiency requirements, tight tolerances on absolute quantities such as beam energy, angles, momenta, etc.

- Experiment is largely counting statistics dominated and thus more tolerant of higher systematic uncertainties
 - Assumes thorough sieve optics measurements have been performed in the first year of SHMS operation and 8-cm or 10-cm long targets
- Even with larger systematic uncertainties in early running scenario, E12-09-011 would compare favorably with the earlier Hall C HMS/SOS experiment

Well-understood HMS determines kinematics

- Uncorrelated Systematic = 2.2% (compare to 2.4-4.0% in E03-018)
 - Scale Systematic (early) = 4.7 %
 - Scale Systematic (later) = 4.2 %
- Experiment uses many 5-9 GeV beam energies besides the highest 10.9 GeV
 - Potentially easier to run in parallel with other Halls

(6) Benefits to Hall C to run early

Describe the benefits to Hall C and subsequent experiments from running your experiment early.

- E12-09-011 will provide the first L/T separated K^+ data above the resonance region
 - PAC34 report: “this would open a new domain for GPD study since virtually nothing is known concerning these quantities when strangeness is in play”
- Collaboration has a good track record of publishing results
- Commissioning of a kaon detection system that allows for carrying out strangeness physics in Hall C
 - Four universities involved plus Yerevan and JLab
 - Detector value equivalent of well beyond \$1M
- Likelihood of graduate students at JLab early on
 - CUA and FIU have already identified possible candidates to obtain PhD on experiment

(7) Pros of experiment running early

Summarize, discussing the pros and cons of running your experiment early.

- E12-09-011 will provide the first L/T separated K^+ data above the resonance region
 - Results will be of significant interest to experimental and theory community
- Collaboration has a good track record of publishing results
- Commissioning of a kaon detection system that allows for carrying out strangeness physics in Hall C
 - Four universities involved plus Yerevan and JLab
 - Detector value equivalent of well beyond \$1M
- Likelihood of graduate students at JLab early on
 - CUA and FIU have already identified possible candidates to obtain PhD on experiment
- Experiment is largely counting statistics dominated and thus more tolerant of higher systematic uncertainties, uses many 5-9 beam energies

E12-09-011: Excellent candidate for **early running**

(#4 or #5 in the cue similar to E93-108)



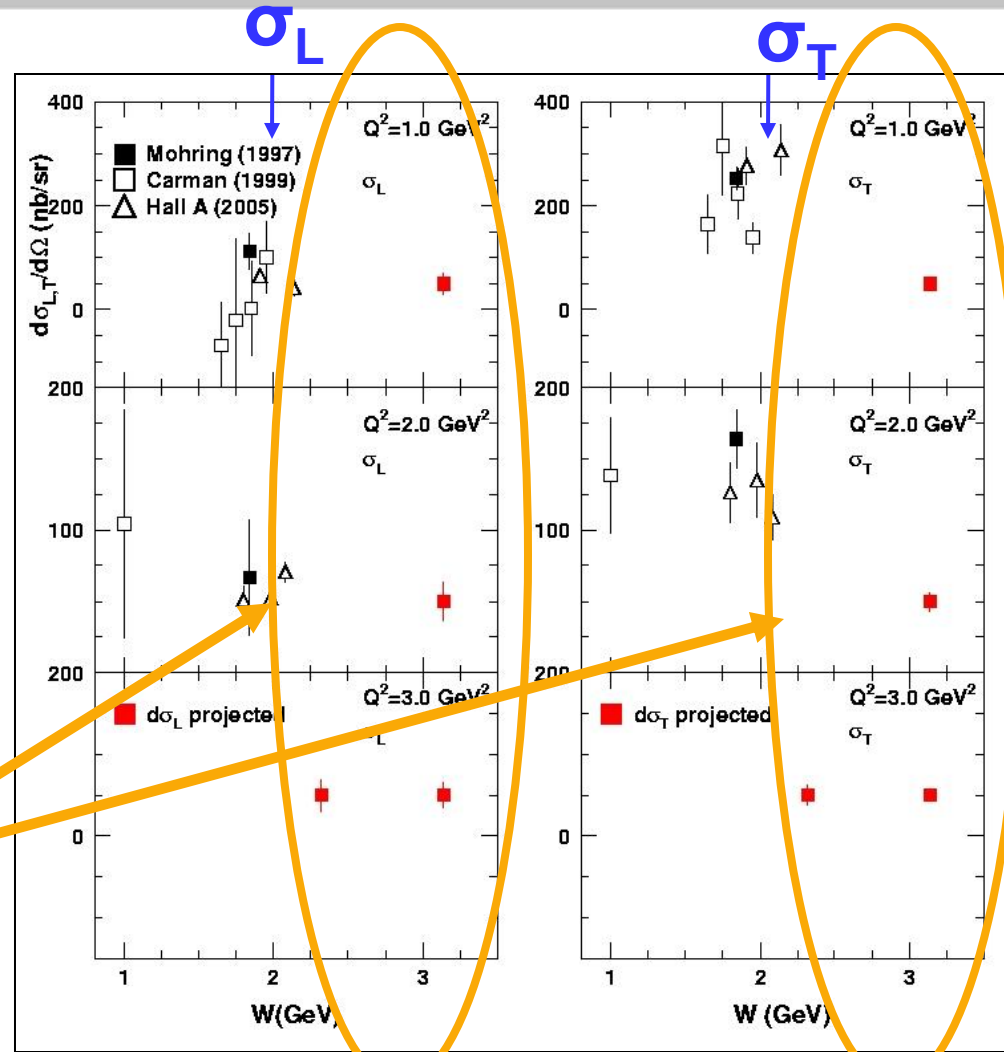
E12-09-011: L-T Separated Kaon production Cross Sections from 5-11 GeV

- Measure the separated cross section of K^+ production above the resonance region
 - Separated cross sections: L, T, LT, TT over a wide range of Q^2 , t-dependence
- The Q^2 dependence will allow studying the scaling behavior of the separated cross sections
 - TAC34: "... [together with π^+ data] the proposed measurement would make a substantial contribution towards understanding not only the K^+ production mechanism, but hard exclusive meson production in general"
 - PAC34 report: "this would open a new domain for GPD study since virtually nothing is known concerning these quantities when strangeness is in play" and "comparing the Q^2 variation of the cross section against the prediction of QCD...is a solid physics case which certainly justifies the experiment"
 - TAC38: "the theoretical motivation stands strong...in the meantime a few improvements to address deficiencies in QCD calculations have been proposed rendering the experiment.."
- The t-dependence allows for detailed studies of the reaction mechanism
 - TAC38: "we encourage the effort to understand the non-pole contributions, which should reduce the model dependence in interpreting the data"
 - Bonus: if warranted

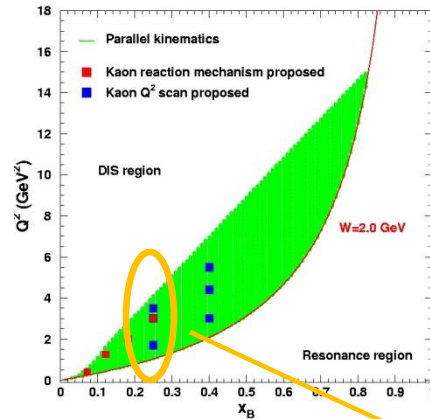
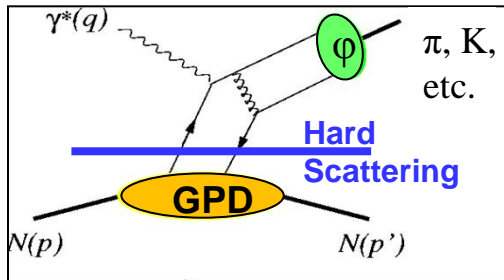
Kaon cross sections: σ_L and σ_T

- E12-09-011 will provide first L/T separated kaon data above the resonance region
- Onset of factorization
- Understanding of hard exclusive reactions
 - QCD model building
 - Coupling constants

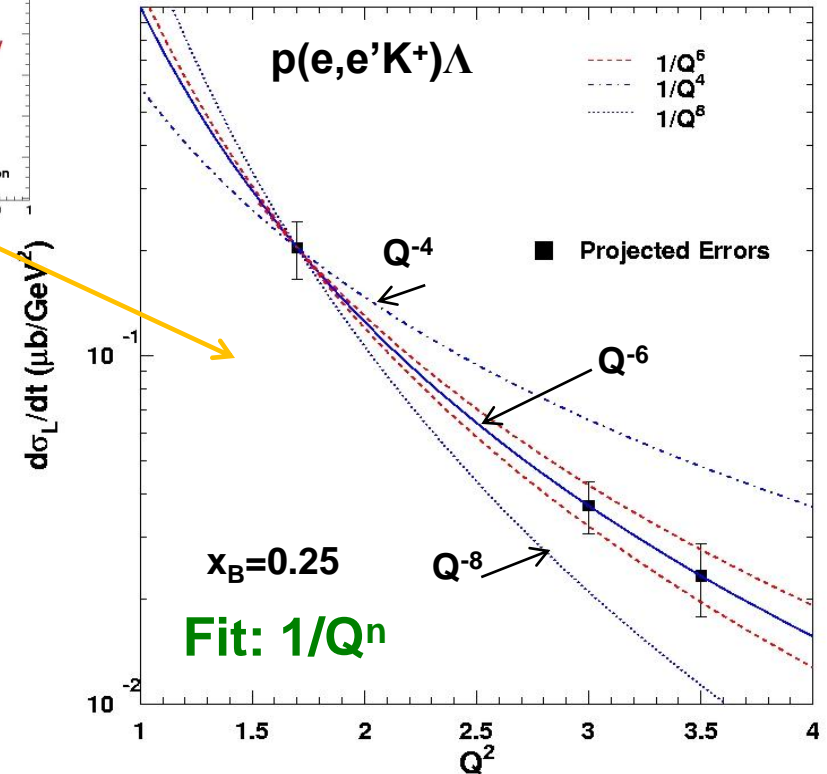
**E12-09-011:
Precision data for
 $W > 2.5$ GeV**



Factorization Tests in K^+ Electroproduction



- Compare the Q^2 dependence and magnitude of separated π^+ and K^+ cross sections, and if possible, the form factors
- Will the analogy in the Q^2 -scaling of the pion cross section and form factor also manifest itself for kaons?



Is onset of scaling different for kaons than pions?

Kaons and pions together provide quasi model-independent study