Report for the

February 3–5, 1998 Meeting
of the
Jefferson Lab
Program Advisory Committee

— PAC13 —

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Dear Members of the Jefferson Lab User Group,

The experimental nuclear physics program at Jefferson Lab is now in full swing with the CLAS detector in Hall B taking physics data as of December. CLAS is already operating within a factor of two of its design luminosity — a real testimony to the hard work of the Hall B Collaboration. Hall A and C are in routine operation. A total of seven experiments have been completed and roughly half of the planned data on tape for three more experiments. The accelerator has its first extended run with the polarized source in December, providing 30 Colulombs of beam for the "dress rehearsal" for the Hall A parity violation experiment. In addition, CEBAF has delivered 4.4-GeV beam for physics, operating at 10 percent above its design gradient. These are significant achievements on the part ofthe User Community, staff, and supporting agencies.

The Jefferson Lab Program Advisory Committee (PAC13) met February 3–5, 1998 to hear details on the progress of the Accelerator and all three Halls, the run plans for all three Halls, and new and updated proposals and letters-of-intent. Attached is the Report of the February 3–5, 1998 Meeting of the Jefferson Lab Program Advisory Committee. I want to thank Brad Filippone and the members of the PAC for their efforts on behalf of Jefferson Lab and its User Community, and for the PAC's thoughtful deliberations on the physics program.

I wish to thank you, the Users, for your efforts on the proposals, updates and letters-of-intent, and I look forward to the flow of publications informing the scientific community of the exciting results coming from the Jefferson Lab experimental program.

Sincerely,

Hermann Grunder
Director

Report of the August 3–5, 1998 Meeting of the
Jefferson Lab Program Advisory Committee (PAC13)

Introduction

The Jefferson Lab Program Advisory Committee held its 13th meeting on Feb. 4–6, 1998, in CEBAF Center. The PAC13 membership is given in Appendix A. In response to the charge (Appendix B) from the Director, Dr. Hermann Grunder, the committee reviewed and made recommendations on 10 new proposals, 1 update of a previously approved proposal, and 6 letters-of-intent. The PAC was also asked to comment on the experimental schedule (see below).

Hermann Grunder and Larry Cardman reported on recent developments in accelerator and experimental Hall performance. Many of the problems experienced last year with attempts at three-hall running have apparently been resolved and successful three-hall running was achieved in December just prior to the scheduled shutdown. Full-scale three-hall operations is expected to begin in March 1998, when it is hoped that accelerator availability will be improved from the 56% achieved in 1997 to the full performance goal of 70%. The PAC was very pleased with the news that all three halls have begun physics production, with Hall B commencing in December 1997. The evolution to higher energy beams will continue with the goal of physics production at 5 GeV in 1998 and 6 GeV in 1999.

Reports from the hall leaders updated the PAC on the status of experimental equipment and on the progress of the physics program. All three halls appear to be operating at near-design specifications with no serious "show-stoppers" in evidence. Hall A expects to begin running high priority experiments in 1998. Hall B anticipates that one-half of all approved proposals will receive "some" beam-time during 1998. Hall C will continue its program with the installation of the high-priority G^n_E experiment using a polarized deuterium target. During the discussion of the approved physics program for each hall, one disturbing fact emerged — all three halls have an experiment backlog of between 4–5 years. (This will be discussed in the next section.) Another significant issue that was discussed was the critical need for highly polarized beam with both low and high currents in order to run the scheduled program for 1998. The PAC was assured that while high polarization has yet to be demonstrated at Jefferson Lab, the low currents need for the G^n_E program should be straightforward to achieve as should the high currents at modest polarization (~40%) needed for the Hall A parity program. However, achieving the higher current (≥10 μA) and high polarization (≥75%) needed for other experiments may be problematic. Given the large number of scheduled experiments that require polarized beam, the PAC was asked to assess progress of the polarized beam development. It was felt that too little information was available at this time; the discussion was postponed to a later PAC meeting.

Experimental Schedule

The PAC had several discussions about the experimental schedule, considering the completed experiments, the short-term (one year) future schedule and early ideas for the longer term. The PAC felt that each hall had selected a set of experiments that addresses the most important physics goals of Jefferson Lab. A significant fraction of the completed or soon-to-be-run experiments were A-rated. Of course, the inauguration of three-hall running in physics production mode is viewed as a major milestone for the Lab. However, a number of concerns were discussed by the PAC.

As discussed in the *Introduction*, the news that all three halls now have an experiment backlog in excess of four years was cause for some concern. Before the operating parameters (reliability, efficiency, etc…) of the machine were known it was reasonable to approve all experiments that were feasible and contained good physics. But now that there is considerable operating experience with the machine, the Lab can estimate the time needed to complete all approved experiments. There was general agreement among the PAC that such a large backlog is not healthy for the user community. It was felt that the Jeopardy Category for proposals not run within three years is not an adequate way to address this problem. In fact, there was considerable sentiment that the Lab may want to consider imposing guidelines to future PACs for a limited number of beam hours. A goal of a three-year backlog would seem to be a reasonable objective.

It was also brought to our attention that the present implementation of the high-power He cryotarget may be a significant hindrance to efficient scheduling. Because of availability of cooling power, the operation of this target in either Hall A or C precludes the other hall from running any high-power cryotarget. Given that a significant number of experiments require high-power liquid hydrogen for calibration purposes (let alone use hydrogen or deuterium for their physics) this situation could likely have a serious impact on the efficient scheduling of high-priority experiments. Possible solutions to this conflict should be seriously pursued by Lab management.

General Comments and Recommendations

The PAC was very pleased to see that operation of Jefferson Lab at full capacity for nuclear physics is imminent. All three halls are apparently operating at near-design specifications. 1998 should also see the beginning of high-priority physics running in all three halls. The submission of the first physics publication from the Lab has occurred and others are about to follow shortly. It is indeed gratifying to see the facility in full operation after the many years of preparation.

The PAC again emphasizes the importance of assigning top priority to establishment of both high-beam polarization (>70%) and high-current polarized beam. The PAC was asked to comment on the progress towards these goals, but given the present uncertainty in polarized beam performance (earlier poor performance has been attributed to identified problems that are being addressed), this discussion has been postponed to a later PAC meeting.

Regarding the jeopardy category for approved experiments, the "t=0" point was set to December 1997 for Hall B. Therefore, Hall B experiments approved before these dates, but not run, must be updated within three years of this date.

The reports and PAC recommendations for the reviewed proposals and letters-of-intent are given in Appendices D and E. The tables on page 6 summarize results from PACs 4–13.

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Brad Filippone
Chair, Jefferson Lab Program Advisory Committee

Date:______________________________________

APPENDICES

A. PAC13 Membership
B. Charge to PAC13
C. PAC13 Recommendations
D. Individual Reports for PAC13 Extensions, Proposals, and Updates
E. Individual Reports for PAC13 Letters-of-Intent
F. Approved Experiments, PACs 4–13, Grouped by Physics Category
(To access Appendix F, type http://www.jlab.org/exp_prog/PACpage/ in your web browser.)

Totals for PACs 4-13

	Experiments Recommended for Approval	Experiments Recommended for Conditional Approval	Totals
Experiments	100	16	116
Authors	659	56	715
Institutions	131	7	138
Countries	21		21

Totals of Approved Experiments by Physics Topics for PACS 4-13

Topic	Number	Hall A	Hall B	Hall C
Nucleon & Meson Form Factors & Sum Rules	14	7	3	4
Few Body Nuclear Properties	23	12	6	5
Properties of Nuclei	16	3	8	5
N* & Meson Properties	31	5	20	6
Strange Quarks	16	3	8	5
Total	**100**	**30**	**45**	**25**

Approved Days and Conditional Approved Experiments by Hall

Hall	Approved Experiments				Conditionally Approved Experiments
	No. of Expts Completed (full/partial)	Days Run	No. of Expts in Queue	Days to be Run	
A	1 / 2	49	29	608	6
B	1 /13 x 0.5	5	44	442	6
C	7 / .5	131	18	412	4
Total	**8 / 2.55**	**185**	**91**	**1462**	**16**

Appendix A

PAC13 Membership

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Appendix B

Charge to PAC13

Following is the charge to the PAC from Jefferson Lab Director, Hermann Grunder:
Jefferson Lab requests that PAC13:

1) Review proposals, extensions and updates and provide advice on their scientific merit, technical feasibility, and resource requirements.

2) Recommend one of four actions on each proposal, extension or update:

- • approval,
- • conditional approval status pending clarification of special issues,
- • deferral, or
- • rejection.

3) Provide a scientific rating and recommended beam-time allocation for all proposals recommended for beam-time.

4) Provide comments on letters-of-intent.

5) Comment on the Hall running schedules.

Appendix C

PAC13 Recommendations

Class*/ Days		
A/25	E-97-101	Baryon Resonance Electroproduction at High-Momentum Transfer
A/33	E-97-102	Measurement of the (e,e'p) Cross Section on Tensor-Polarized Deuterium
A/16	E-97-103	Search for Higher Twist Effects in the Neutron Spin Structure Function $g_2^n(x,Q^2)$
A/=	E-97-104	Measurement of the Parity Violating Asymmetry in the $N \rightarrow \Delta$ Transition
A/11	E-97-106	Studying the Internal Small-Distance Structure of Nuclei via the Triple Coincidence $(e,e'\,p+N)$ Measurement
D	PR-97-107	Study of Neutron Resonances by Low-Energy Neutron Tagging (LENT)
A/10	E-97-108	Exclusive Compton Scattering on the Proton
D	PR-97-109	Study of the Reaction ${}^2H(\vec{e},e'\vec{p})n$ in the Δ Region
A/18	E-97-110	The GDH Sum Rule and the Spin Structure of ${}^3He$ and the Neutron using Nearly Real Photons
A/12	E-97-111	Systematic Probe of Short-Range Correlations via the Reaction ${}^4He(e,e'p)^3H$
A/21	E-94-101	Precision Measurement of the Neutron Asymmetry of A_1^n at Large X_{B_j} Using JLab at 6 GeV

* **A=Approve, C=Conditionally Approve, D=Defer, R=Reject**

= Concurrent running with already approved Hall C experiment.

Appendix D

Individual Proposal Reports

Proposal: E-97-101

Scientific Rating: B+

Spokesperson(s): V. Frolov, J.W. Price, P. Stoler

Title: Baryon Resonance Electroproduction at High-Momentum Transfer

Motivation:

This experiment is a search for evidence in the resonance electroproduction of the $\Delta(1232)$ and S_{11} for a transition from the soft non-perturbative QCD processes at low Q^2 to hard processes described by perturbative QCD.

Measurements and Feasibility:

This proposal is an extension to higher Q^2 of E-94-014, in which electroproduction of the $\Delta(1232)$ and the $S_{11}(1535)$ resonances were measured in the kinematically complete $p(e,e'p)\pi,\eta$ reactions. Degradation of kinematic resolutions with increasing Q^2 ultimately limits the measurements proposed. While final results of the analysis of E-94-014 are not yet available, preliminary results on $\Delta(1232)$ excitation for the M1+, E1+/M1+, and S1+/M1+ already provide new results of wide interest. The final precision achievable for these quantities will be determined by the systematic errors which are, as yet, unreported.

Issues:

Measurements over a large range of Q^2 provide greatest potential for detecting a transition in the character of the transition amplitudes. In view of the slow variation of Q^2 which characterize the transition amplitudes, measurements at the highest Q^2 possible should be adequate to address the issues of interest.

Recommendation:

Approval for 25 days of running at 6 GeV.

Appendix D (Continued)

Proposal: E-97-102

Scientific Rating: A-

Spokesperson(s): W.U. Boeglin, H.C. Anklin

Title: Measurement of the (e,e'p) Cross Section on Tensor-Polarized Deuterium

Motivation:

This experiment proposes to study the two-nucleon density distributions in the deuteron with the (e,e'p) reaction. In particular, it proposes to measure the spin projection, M_d, dependence of the cross section of the process for missing momentum values between 200 MeV/c and 380 MeV/c. This measurement could provide information on the short-range structure of the deuteron.

Measurement and Feasibility:

Using a tensor-polarized target, the experiment will measure the tensor analyzing power, A_{xx}, and the unpolarized cross section of the $^2H(e,e'p)n$ reaction at a momentum transfer of 500 MeV/c in parallel kinematics. Electrons scattered at an angle of 14 degrees will be detected in the SOS and protons in the HMS. Five measurements are planned to cover a range in missing momentum from 200 MeV/c to 380 MeV/c. A_{xx} is determined from relative cross section measurements with the target tensor polarized and unpolarized in the same setup. With knowledge of both A_{xx} and unpolarized cross sections for scattering off the deuteron, the cross section of different M_d sub-states can be determined.

Issues:

The structure of the ground state wave function in nuclei at small interparticle distance is still an unsolved problem. The deuteron is a suitable target to start this investigation because its structure can be calculated with high precision using realistic NN potentials. The PAC strongly encourages effort to optimize kinematics to match standard energies.

Recommendation:

Approval for 33 days.

Proposal: E-97-103

Scientific Rating: B+

Spokesperson(s): T. Averett, W. Korsch

Title: Search for Higher Twist Effects in the Neutron Spin Structure Function $g_2^n(xQ^2)$

Motivation:

The experiment aims at the first high-precision measurement of g_2^n in the range $0.6 < Q^2 < 1.5$ $(\mathrm{GeV/c})^2$ for $0.14 < x < 0.22$. The motivation is the search for higher twist (HT) effects, which are expected to increase as Q^2 decreases. The HT effects will be sought by comparing the measured g_2^n values to the known Wandzura-Wilczek contribution inferred from the existing experimental data on g_1^n.

Measurements and Feasibility:

The experiment requires the measurement of the inclusive polarized electron scattering asymmetry, on polarized neutrons, provided by a polarized ^{3}He target. Both Hall A spectrometers will be used as independent electron detectors. A beam current of 15 μA, polarized at 80%, is requested for 710 hours. All the experimental requirements are in the range of feasibility, for the beam, the target and the detection.

Issues:

The PAC supports the physics goals of the experiment. It has been acknowledged that the proposed “double” x range is the only solution to match the spectrometer acceptance with the Q^2 lever-arm aimed for. But it is considered that the priority is first to show the existence of visible HT effects, and therefore the kinematic settings, 1, 2, and 4 are considered sufficient.

Recommendation:

Approval for 16 days.

Proposal: E-97-104

Scientific Rating: B+

Spokesperson(s): S.P. Wells, N. Simicevic, K. Johnston

Title: Measurement of the Parity Violating Asymmetry in the N to Delta Transition

Motivation:

To use the inelastic channel parity violating asymmetry data for inclusive pion electroproduction from the proton through the Δ resonance to extract the axial vector transition form factor, $G^A_{N\Delta}$. Compared to alternative techniques for obtaining information on this form factor, the proposed measurements provide direct access to $G^A_{N\Delta}$ and represent the first determination of this form factor in the neutral current sector. This is an important physics goal which should significantly improve the knowledge of the N $\rightarrow \Delta$ axial vector current matrix element.

Measurements and Feasibility:

This experiment has the big advantage of being run simultaneously with the G^0 experiment. Only a small change in the trigger logic allows the inelastic asymmetry to be recorded simultaneously. The G^0 group has indicated their support for this added set of measurements.

Issues:

The ability to accurately extract the axial vector transition form factor $G^A_{N\Delta}$ depends upon an analysis of Hall B one pion electroproduction data being used to provide non-resonant background contributions. Some contamination from two pions in the inclusive data will occur for values of W above the Δ peak. Effects of isospin breaking effects have not been examined.

Recommendation:

Approval for concurrent running with G^0.

Proposal: E-97-106

Scientific Rating: B+

Spokesperson(s): W. Bertozzi, E. Piasetsky, J. Watson, S.A. Wood

Title: Studying the Internal Small-Distance Structure of Nuclei via the Triple Coincidence (e,ep+N) Measurement

Motivation:

The proposers seek to determine the fraction of (e,e'p) strength associated with two-nucleon short-range correlations.

Measurements and Feasibility:

An exploratory measurement of the $^{12}C(e,e'pN)$ reaction was felt to be an appropriate first step toward establishing the utility of triple coincidence studies for probing the short-distance structure of nuclei. The kinematics, high x and Q^2, are well chosen to give the best chance of minimizing the role of FSI and MEC. Determination of both the pp and pn cross sections was also important.

Issues:

Estimates of competing processes were not sufficiently quantitative. Accordingly, the PAC was not entirely convinced that all the relevant backgrounds had been accurately estimated and, given both FSI and Fermi smearing, how distinct the actual experimental signal would be. Any problems here are likely to be exacerbated with increasing Q^2 due to the decreasing e-N cross section. Demonstration of a separable signal at the lower Q^2 should occur before approval of beam-time for the more difficult higher Q^2. The PAC would like to see a stronger case made for the benefit of Q^2 variation in verifying the reaction mechanism,. A calibration of the entire setup with deuterium could be quite useful; the proponents should investigate the feasibility of doing so within the allotted time.

Recommendation:

Approval of the lower Q^2 measurement for 11 days.

Proposal: PR-97-107

Scientific Rating: None

Spokesperson(s): C.E. Keppel, R. Ent, J. H. Mitchell

Title: Study of Neutron Resonances by Low-Energy Neutron Tagging (LENT)

Motivation:

This is a proposal to measure the inclusive virtual photon neutron cross section over the Q^2 range $1< Q^2 <3.5$ (GeV/c) ^{2} and the hadronic recoil mass range 1 - 2 GeV. The experiment consists of using a 6-GeV electron beam incident on a deuterium target and detecting the scattered electron in coincidence with the low energy recoil proton.

Measurements and Feasibility:

The PAC believes this is an interesting and useful program. However, there were several subjects that should be investigated before approval. The background rates test that was described in the proposal was performed with the 2.65 inch diameter Hall C LD2 target. There was strong recommendation to make more tests, for example by studying the change in background rates induced by moving the beam closer to the wall (say within 0.5 cm) in the existing Hall C LD2 target.

Issues:

The PAC was not convinced that measurements focusing on missing momentum between 150 MeV/c and 200 MeV/c would yield reliable information on neutron structure due to issues such as final state interactions. It was felt that if an experiment could be designed that would allow measurements with a minimum missing energy ~80 MeV/c, this proposal would be considerably strengthened.

The PAC was also concerned that (even at low-missing momentum) the reaction mechanism assumed in the proposal may not lead directly to information on neutron structure. For example, the virtual photon may be absorbed by the deuteron and then the excited deuteron decays into two baryons (and possibly a few pions). The collaboration may want to consider a “calibration” experiment where the neutron is measured and the proton is tagged in order to compare with the known proton structure.

PAC views this proposal as a promising technique to provide important information on neutron structure but would need to see the above issues addressed before a new proposal could be approved.

Recommendation:

Defer.

Proposal: E-97-108

Scientific Rating: B+

Spokesperson(s): B. Wojtsekhowski, A.M. Nathan, C. Hyde-Wright

Title: Exclusive Compton Scattering on the Proton

Motivation:

Compton scattering at high s and t is a promising tool to study the short-distance structure of the nucleon. Several conceptually different theoretical investigations have been carried out in the transition region toward hard scattering and the presently available data indicate the inadequacy of the different theoretical approaches. The proposed data set, improving by a factor of two to five on the existing data set and extending into a wider kinematic range, should provide further guidance for developments of the theory.

Measurements and Feasibility:

Because of the small cross sections, high luminosity is needed. By the use of a mixed beam of electrons and Bremsstrahlung photons and a target 15-cm long, this high luminosity can be achieved. The suppression of the high π^0 background needs good in-plane discrimination of the proton-gamma events. This goal can be reached by the combined use of the electron spectrometer in Hall A to detect the recoil protons and a highly segmented lead glass array to detect the scattered photons.

However, high singles rates in both arms lead to a high rate of accidentals. Good performance of the lead glass detector in this high background environment has to be established. Test measurements can help characterize the background.

Issues:

Future test measurements may be able to demonstrate that a proper anti-coincidence detector array to veto charged particles can be applied.

Recommendation:

Approval for 10 days at 6 GeV.

Proposal: PR-97-109

Scientific Rating: None

Spokesperson(s): Zi Li Zhou, W. Bertozzi

Title: Study of the Reaction ${}^2H(\vec{e},e'\vec{p})n$ in the Delta Region

Motivation:

This experiment proposes to use polarization transfer to separate a number of the deuterium (e,e'p) response functions, including $f_{LT,} f^{n}_{LT,} f^{'l}_{T} f^{'t}_{T}$ and $f^{.t}_{LT}$ at $Q^2 = 0.26 Gev^2$ and energy transfer on top of the $\Delta(1232)$ peak. Calculations indicate sensitivity to several of the features of the theoretical description of electron-deuteron reactions, particularly Isobar currents.

Measurements and Feasibility:

The measurements are proposed for Hall A using fixed electron kinematics and the Hall A focal plane polarimeter. We are confident that the collaboration can perform the proposed measurements as planned.

Issues:

We do not consider the scientific motivation of the experiment sufficiently focused. The kinematics chosen emphasize Isobar currents and Delta-nucleon coupled channel effects. The calculations presented use low energy N-N interaction which is unlikely to describe this physics and it was not clear whether this is the best choice of data to effectively constrain our understanding of the Delta dynamics. We note that similar physics will be addressed in separated electroproduction and photoproduction response-function analyses (in a different set of response functions) in measurements on polarized deuterium in Hall B. A significant increase in our understanding of the Delta-nucleon interaction or Isobar currents would be an important addition to our knowledge of the electronuclear response and the baryon-baryon interaction.

We ask the collaboration to define specific goals and convince us that the choice of kinematics is optimized to address these goals. We also expect the collaboration to compare the significance of their proposal to the approved Hall B experiments.

Recommendation:

Defer.

Proposal: E-97-110

Scientific Rating: A-

Spokesperson(s): F. Garibaldi, J.-P. Chen, and G.D. Cates

Title: The GDH Sum Rule and the Spin Structure of ^3He and the Neutron Using Nearly Real Photons

Motivation:

This experiment proposes to test the GDH sum rule for ^3He at $0.02 < Q^2 < 0.5$ (GeV/c)^2 and study its slope and value at the real photon point. It also aims to provide a test of how well polarized ^3He approximates a polarized neutron target.

Measurements and Feasibility:

These measurements will become possible with the planned installation of a pair of septum magnets for the Hall A spectrometers, which allows study of electron scattering at small Q^2, the development of polarized ^3He target, and 80% polarized electron beam up to 6 GeV.

Issues:

The GDH sum rules for ^3He and neutron are very different; -496 μb and -232.8 μb respectively. The strength beyond pion production threshold would primarily come from parts contributing to the neutron sum, while that below pion threshold is expected to account for the difference. Verification of such a distribution of strength will indicate how well polarized ^3He approximates a polarized neutron target in this reaction. This will require careful measurements at relatively small energy loss ν. On the other hand, data at large ν are necessary to test convergence of the sum rule integral. Interpolation between data will be needed to obtain the GDH sum at fixed values of Q^2.

Recommendation:

Approved for 18 days at 6 GeV.

Proposal: E-97-111

Scientific Rating: B+

Spokesperson(s): J. A. Templon

Title: Systematic Probe of Short-Range Correlations via the Reaction $^4He(e,e'p)^3H$

Motivation:

Modern ^4He wavefunction calculations predict an as yet unobserved sharp dip in the p-t spectral function near 430 MeV/c. In order to reduce and vary the strength of the final-state interaction (FSI) and meson-exchange current (MEC) contributions that have plagued earlier $^4He(e,e'p)$ experiments, and filled in the dip, the measurements proposed here are to be carried out at significantly higher Q^2, and under several sets of kinematic conditions.

Measurements and Feasibility:

The PAC is convinced of the feasibility of the proposed measurements.

Issues:

The comparative measurements under the chosen kinematic conditions are likely to provide a useful test of the (e,e'p) reaction mechanism with relevance to other experiments that will search for short-range correlations at high missing energy. The pure s-wave p-t channel is well suited to this mechanism study. The PAC doubts the interpretation of the spectral function dip as a signature for short-range correlations in ^4He.

Recommendation:

Approval for 12 days in Hall A.

Proposal: E-94-101 (Update)

Scientific Rating: B

Spokesperson(s): Z.-E. Meziani, P. A. Souder

Title: Precision Measurement of the Neutron Asymmetry A_1^n at Large x Using JLab at 6 GeV

Motivation:

E-94-101 Update proposes to measure the spin asymmetry A_1^n in inclusive inelastic electron scattering at 6 GeV for a set of points: 0.25 $< X_{B_j}$ <0.63 at 2.5 $< Q^2$ <5.3 (GeV/c)^2. Models predict this asymmetry to be large and positive as x approaches 1. Existing data do not yet exhibit this behavior for x <0.4. This measurement should clarify the high x behavior of A_1^n.

Measurement and Feasibility:

The experimental technique uses an 80% polarized electron beam at a modest current (15 microamps) at a beam energy of 6 GeV. The target is a polarized ^3He gas cell pressurized to 10 atmospheres in glass and pumped to 40% polarization by 100 watts of diode laser power. These techniques have been (mostly) implemented in previous experiments at other labs. Achieving this high-beam energy and high beam and target polarization are required for E-94-101 to achieve its stated precision. Experimental corrections due to nuclear effects in ^3He, Fermi motion, and radiative effects must be promptly made, but they are not expected to be large at the proposed x values.

Issues:

Since the original conditional approval in 1994, there have been several other experiments on A_1^n at SLAC, CERN, and DESY. The experiments E142, E143, E154, SMC, and HERMES have established good experimental values for A_1^n for values of x <0.4. For the neutron sum rule, the high x region does not contribute significantly to the integral of g_1^n over x. (Both the Ellis-Jaffe Sum Rule and the Bjorken Sum Rule are well measured.) This proposal will not significantly add to or improve this situation. The main objective of E-94-101 Update is to obtain high statistics at large x. The PAC feels the basic physics goals could be met with fewer x points.

Recommendation:

Approval for 21 days.

Appendix E

Individual Letter-of-Intent Reports

Letter of Intent: LOI-97-101

Spokesperson(s): A. Aganyants, et al

Title: Intensity Dependent Effects in High-Energy Electron Beam Losses on Oriented Monocrystal

This letter-of-intent does not address any of the issues mentioned in the last PAC report. The letter does not provide enough detail on the physics justification or the proposed measurements. We will not consider this letter further until the issues raised in the last report are addressed.

Letter-of-Intent: LOI -97-102

Spokesperson(s): Z. Papandreou, E.J. Brash

Title: Short-Range Correlations in the $^{3}He(e,e'pp)n$ Reaction via a Rosenbluth Separation

Triple coincidence experiments are likely to provide direct information on short-range correlations in nuclei, and it is appropriate to perform such studies with the helium isotopes. A complete proposal would need to address the following issues: (1) Overlap with approved experiments in Hall B and the (e,e'pN) experiment in Hall C, and the need for a new experiment. (2) The necessity and feasibility of L/T separation. (3) The possibility of studying both (e,e'pp) and (e,e'pn) since the dominant short-range correlations are expected to occur in T=0, S=1 np pairs.

Appendix E (Continued)

Letter-of-Intent: LOI-97-103

Spokesperson(s): E.J. Brash, G.J. Lolos

Title: Polarization Asymmetries in Deuterium via the $^2H(e,e'p\vec{n})$ Reaction

This letter-of-intent proposes to probe the spin structure of the two-nucleon density distributions by measuring the two-nucleon spin correlation asymmetry in the $^2H(e,e'p\vec{n})$ reaction. The physics which would be addressed is similar to that in PR-97-102. PR-97-102 will use a tensor polarized target to measure the tensor analyzing power in the $^2H(e,e'p\vec{n})$ reaction. Because the signal of the measurement proposed in this letter-of-intent is attenuated by a cancellation between longitudinal and transverse asymmetries, the approach of PR-97-102 is judged to be cleaner and more promising. A second study of the deuteron density distributions using the two-nucleon spin correlation is not compelling.

Letter-of-Intent: LOI-97-104

Spokesperson(s): J. Dunne

Title: Sub-Threshold J/Ψ Meson Photo-Production

This LOI proposes to use subthreshold J/Ψ production on different nuclear targets to measure the J/Ψ-N cross section. Because the J/Ψ production relies on the detailed shape of the high-momentum tail of the nuclear wave function for different nuclei, it is unlikely that sufficient precision could be obtained to extract the J/Ψ-N cross section as proposed. However, the PAC feels that exploring sub-threshold J/Ψ production from a nucleus is an exciting possibility and would consider a full proposal. The collaboration may also want to consider measuring sub-threshold phi production complementing the J/Ψ production.

Letter of Intent: LOI-97-105

Spokesperson(s): F.W. Hersman

Title: Measurement of the ^3He Spin-Dependent Spectral Function Using $^3\overrightarrow{He}(\vec{e},e'n)$ in Hall A

The PAC is interested in the spin-dependent spectral function of ^3He, but would prefer to see results of the approved $^3He(e,e'p)$ experiment E-94-023 for this study before entertaining a new proposal for $(\vec{e},e'n)$.

Letter-of-Intent: LOI-97-106

Spokesperson(s): A. Gasparian

Title: A Precision Measurement of the Neutral Pion Lifetime via the Primakoff Effect

A precise measurement of the π^0 lifetime provides an important test for refined calculations addressing the axial anomaly going beyond the triangle graph.

In a direct measurement, the lifetime was determined with an accuracy of 3–4%. Calculations of the next order corrections to the axial anomaly for finite pion mass have been performed with a theoretical uncertainty of about 2%.

In order to check the calculations, the uncertainty of the data of a future experiment should not exceed 1–1.5%.

Besides the experimental challenge posed by such a precision experiment, a sophisticated investigation of the corrections due to the nuclear structure of the heavy nucleus and the final state interaction of the pion with the nucleus has to be carried out. The PAC looks forward to a proposal detailing the procedures to achieve the necessary precision.

Appendix F

PACs 4–13, Grouped by Physics Category

To access Appendix F (titled Experiment Summary), type
http://www.jlab.org/exp_prog/PACpage/
in your web browser.

Appendix F includes a list of experiments organized by physics category including rating, hall, spokesperson(s), etc.