Report of the August 4–6, 1997 Meeting of the Jefferson Lab Program Advisory Committee

— PAC12 —

The Thomas Jefferson National Accelerator Facility (Jefferson Lab) is a national physics user facility managed by the Southeastern Universities Research Association (SURA), Inc., for the U.S. Department of Energy (DOE) under contract DE-AC05-84ER40150.

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Dear Members of the Jefferson Lab User Group,

Halls A and C are both in full operation and Hall B is incommissioning with its first experiment scheduled for December of this year. Six experiments have completed all of their data including the first experiment with a major installation beyond the base equipment, plus three experiments have half of their data. The Accelerator has achieved its full designed power level of 800 kW while running at 200 μamps and 4 GeV. These are significant achievements on the part ofthe User Community, staff and supporting agencies.

The Jefferson Lab Program Advisory Committee (PAC12) met August 4–6, 1997 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 August 4–6, 1997 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 4–6, 1997 Meeting of the Jefferson Lab Program Advisory Committee

Introduction

The Jefferson Lab Program Advisory Committee held its 12th meeting on Aug. 4–6, 1997, in CEBAF Center. The PAC12 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 eleven new proposals, two updates of previously approved proposals and two resubmissions of previously deferred proposals. The PAC also provided comments on four letters-of-intent.

Nathan Isgur and Larry Cardman reported on recent developments in accelerator operation and in the experimental Halls. A recent, significant modification in accelerator operations was presented, where simultaneous three-Hall operation would be replaced with two-Hall operation only. This change was the result of a number of factors that led to a significant operations inefficiency when running three Halls simultaneously. It is expected that forthcoming modifications to hardware and to procedures should allow resumption of three-Hall operation within six to twelve months. The anticipated evolution of the beam energy to E > 4 GeV will be postponed until routine three-Hall operation is achieved.

Reports from the Hall leaders updated the PAC on the status of experimental equipment and on the progress of the physics program. Hall A has begun its physics program, including taking data with a 40% polarized beam. A better understanding of the spectrometers in the Hall indicates that they should operate close to design specifications in terms of acceptance and maximum momentum. Hall B has demonstrated that it can achieve design luminosity and anticipates beginning its physics program within 4–6 months. Hall C has completed 6 experiments including its first major installation experiment measuring t_{20} of the deuteron. In general, the PAC was pleased with progress in the Halls.

General Comments and Recommendations

The PAC was pleased to see the steady progress towards operation of Jefferson Laboratory at full capacity for the Nuclear Physics community. It appears that this goal should be achievable within the next six to twelve months. The PAC understood the decision to first establish stable two-Hall operation before proceeding with three-Hall operation and then to E > 4 GeV.

It is encouraging to see the physics program beginning to produce its first data, and the PAC eagerly awaits the publication of results from the first physics experiments at Jefferson Lab.

The charge to PAC12 included commenting on the Hall running schedules. However given the very recent changes in operations and schedules (due to two-Hall running) and the uncertainty in the time to reestablish three-Hall operation, this discussion should be addressed at a later PAC meeting.

The PAC again reiterated its concern that establishment of high beam polarization (> 70%) and high-current polarized beam must remain a top priority at the laboratory. The bulk of the highest-rated physics program requires one or both of these conditions and several of these experiments are scheduled to run within the next year.

The establishment of the jeopardy category for experiments not yet run was briefly discussed by the PAC. For Hall's A and C the "t = 0" point was set to June 1997 and December 1995 for the two Halls respectively. Experiments approved before these dates must be updated within three years of these dates.

During the course of reviewing the new proposals presented to PAC12, the PAC spent considerable time comparing the new proposals with previously approved proposals with similar physics goals. This problem will surely become worse with time. The PAC therefore recommends that management require future proposal submissions to compare and contrast their experiment with any previously approved experiments that share similar physics goals.

The reports and PAC recommendations for proposals and letters-of-intent reviewed are given in Appendices D and E. The following tables summarize results from PACs 4–12.

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Brad Filippone
Chair, Jefferson Lab Program Advisory Committee

Date: _____

Appendices

A. PAC12 Membership
B. Charge to PAC12
C. PAC12 Recommendations
D. Individual Rrports for PAC12 Extensions, Proposals, and Updates
E. Individual REports for PAC12 Letters-of-Intent
F. Approved Experiments, PACs 4–12, Grouped by Physics Category

Totals for PACs 4-12

	Experiments Recommended for Approval	Additional Experiments Recommended for Conditional Approval	Total
Experiments	91	17	108
Authors	662	57	725
Institutions	130	7	135
Countries	21		21

Totals of Approved Experiments by Physics Topic for PACs 4-12

Topic	Number	Hall A	Hall B	Hall C
Nucleon and Meson Form Factors and Sum Rules	11	4	3	4
Few Body Nuclear Properties	21	11	6	4
Properties of Nuclei	15	3	8	4
*N** and Meson Properties	29	4	20	5
Strange Quarks	15	3	8	4
Total	91	25	45	21

Approved Days and Conditional Approved Experiments by Hall

Hall	Approved Experiments				Conditionally Approved Experiments
	No. of Expts Completed	Days Run	No. of Expts in Queue	Days to be Run	
A	1/2 + 1/2	25	24	555	7
B			45	447	6
C	6-1/2	121	14-1/2	353	4
Total	7-1/2	146	83-1/2	1355	17

Appendix A
PAC12 Membership

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Appendix B
Charge to PAC12

Charge to PAC12

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

Jefferson Lab requests that PAC12:

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

PAC12 Recommendations

Class†-Days*		
A–18	E-89-019	Measurement of the Proton Polarization in the $d(\vec{\gamma}, \vec{p})n$ Reaction
A–8	E-94-012	Measurement of Photoproton Polarization in the $H(\vec{\gamma}, \vec{p})\pi^\circ$ Reaction
R	PR-94-020	Investigation of the ^{3}He Wave Function Using the $^3\vec{He}(\vec{e}, e'p)d$ and $^3\vec{He}(\vec{e}, e'p)pn$ Reactions
A–24	E-94-023	Measurement of Small Components of the ^{3}He Wave Function Using $^3\vec{He}(\vec{e}, e'p)$ in Hall A
B–16‡	E-97-001	Electroproduction of the $pp\pi-$ System off the Deuteron Beyond the Quasifree Region
D	PR-97-002	Baryon Resonance Eletroproduction at High-Momentum Transfer
D	PR-97-003	Electroproduction on ^{3}He and ^{4}He
R	PR-97-004	Study of Generation and Decay of Fissioning Hypernuclei
C	E-97-005	Photoproduction of φ Mesons with Linearly Polarized Photons
C–15	E-97-006	Correlated Spectral Function and $(e,e'p)$ Reaction Mechanism
C	E-97-007	Polarization Transfer in Kaon Electroproduction
C–15	E-97-008	Spectroscopic Study of Lambda Hypernuclei Beyond the *p*-shell Region through the $(e,e'K^+)$ Reaction
C	E-97-009	Measurement of $F_{\gamma^*\gamma\pi^0}$ at Low Q^2 via the Virtual Primakoff Effect
C–3	E-97-010	Measurement of Hydrogen and Deuterium Inclusive Resonance Cross-Sections at Intermediate Q^2 for Parton-Hadron Duality Studies
A–13	E-97-011	Initial Exploration of Semi-exclusive Scattering in $x > 1$ Region with ^{3,4}He$(e,e'p)$ Reactions

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

‡ Time is included in already approved running in Hall B.

Appendix D

Experiment: E-89-019, Hall A

Spokesperson: R. Gilman, R. J. Holt, Z.-E. Meziani

Title: Measurement of the Proton Polarization in the $d(\gamma,p)n$ Reaction

Scientific Rating: B+

Motivation:

This proposal is an update of the E-89-019 experiment, approved for 18 days. This update covers part of the region in photon energy where SLAC experiments NE8 and NE17 and JLab experiment E-89-012 have shown that the deuteron photodisintegration cross sections at 90° in the center of mass follow constituent counting rules.

At photon energies below 1 GeV, the recoil proton polarization is measured to be negative and shows structure. The experiment searches for the onset of scaling behavior via the vanishing of the proton polarization with increasing photon energy. If the scaling regime of pQCD is reached, helicity conservation results in vanishing polarization.

Measurements:

A 0° Bremsstrahlung photon beam is produced by the electron beam striking a 6% radiation length Cu radiator placed 35cm upstream of the target. Polarization of the recoil proton is determined by the HRS-H focal plane polarimeter, which has recently been commissioned and shown to exhibit adequately small false asymmetry. Data would be taken at 5 electron energies from 0.8 to 2.4 GeV.

Feasibility and Issues:

It would be interesting to follow the observation of apparent scaling in deuteron photodisintegration with a polarization measurement to test the scaling hypothesis further. The PAC is concerned that the experimental technique cannot be used above 2.4 GeV, since this minimizes the extent of the measurement into the putative scaling region. The collaboration has indicated the exact energies requested are not essential; thus, the PAC recommends using standard beam energies.

The collaboration has addressed the issues raised by PAC7 concerning the operation of the focal plane polarimeter, spin transport through the Hall A spectrometer, and statistical precision which can be obtained.

Recommendation: Approved for previously approved 18 days with upgraded scientific rating of B+.

Appendix D

Experiment: E-94-012, Hall A

Spokespersons: R. Gilman, R. Holt

Title: Measurement of Photoproton Polarization in the $H(\gamma, \vec{p})\pi^o$ Reaction

Scientific Rating: B+

Motivation:

This updated proposal extends the $H(\gamma, \vec{p})\pi^o$ experiment (E-94-012) approved for three days with B– priority, by increasing the incident beam energy up to 5 GeV and extending the angular distribution to 120°. The experiment will use a circularly polarized beam of photons to determine the polarization transfers (C_Z and C_X) in addition to the induced polarization P. The stated goal of this experiment is to test if in this kinematics range, one can observe an evolution to the pQCD regime.

Measurement, Feasibility, and Issues:

The technical concerns previously raised by the PAC about the backgrounds generated by the target end caps and on the calibration of the focal plane polarimeter have been satisfactorily answered.

Recommendation: Approved for the original 3 days plus 5 additional days at 5 GeV as requested for a total of 8 days.

Appendix D

Proposal: PR-94-020, Hall A

Spokesperson: W. Korsch, R. McKeown, Z.-E. Meziani

Title: Investigation of the ^{3}He Wave Function using the $^3\vec{\mathrm{H}}\mathrm{e}(\vec{e}, e'p)d$ and the $^3\vec{\mathrm{H}}\mathrm{e}(\vec{e}, e'p)pn$ Reactions

Motivation:

It is proposed to measure spin correlation parameters in (e,$e'p$) on a high-density polarized ^{3}He target in order to study the effects of the S' and D states of the ^{3}He ground-state wave function. Such information would test Faddeev calculations of ^{3}He structure and provide constraints on the suitability of polarized ^{3}He as a surrogate for polarized neutron targets.

Measurements and Feasibility:

A 4.0 GeV polarized electron beam would bombard a spin-exchange $^3\vec{\mathrm{H}}\mathrm{e}$ target, to be provided by the collaboration for several Hall A experiments. Data would be collected with the target polarization both parallel and perpendicular to the momentum transfer. The Hall A spectrometer pair would be run at fixed angles, corresponding to 1.0 $(\mathrm{GeV}/c)^2$ and to zero missing momentum at the center of the acceptance. With the finite acceptance of the spectrometers, information can be obtained out to $P_m \sim 225$ MeV/c. Both pd and ppn (up to a missing energy of 40 MeV) final states would be investigated.

The PAC was convinced of the feasibility of the proposed measurements, and, in particular, of the ability of the collaboration to provide a polarized ^{3}He target meeting the design goals.

Issues:

The PAC strongly endorses the desirability of (e,$e'p$) measurements probing the ^{3}He S' and D states. Measurements at Jefferson Lab would complement ongoing studies at Bates and NIKHEF, which are performed at lower energies, where the reaction is subject to larger final-state interaction (FSI) effects.

However, the PAC was not convinced that the present proposal would lead to clear results on the small ^{3}He wave function components. In particular, the choice of kinematics is not optimal: the non-collinear kinematics used to extract data at the higher missing momentum values introduces contributions from two competing polarized response functions. The corresponding D state contributions appear to cancel in the longitudinal spin correlation A_z, leaving calculated effects dominated by meson exchange currents, rather than by unmapped ^{3}He wave function components. Furthermore, there is no S' state sensitivity for the pd final state. Since theoretical calculations were not presented for the ppn continuum under the proposed kinematics, the sensitivity to the S' state in that region was also not demonstrated.

The PAC found the competing proposal E-94-023 to be better optimized to extract information on S' and D states of ^{3}He, and recommends that a ^{3}He*(e,e'p)* experiment be performed in the kinematics of that proposal. The PAC hopes that the PR-94-020 collaborators will be willing to participate in that effort.

Recommendation: Rejected.

Appendix D

Experiment: E-94-023, Hall A

Spokesperson: F.W. Hersman

Title: Measurement of small components of the ^{3}He wave function using $^3\vec{\text{He}}(\vec{e}, e'p)$ in Hall A

Scientific Rating: B+

Motivation:

It is proposed to measure spin correlation parameters in (e,$e'p$) on a high-density polarized ^{3}He target in order to study effects of the S' and D states of the ^{3}He ground-state wave function. Such information would test Faddeev calculations of ^{3}He structure, and provide constraints on the suitability of polarized ^{3}He as a surrogate for polarized neutron targets.

Measurement and Feasibility:

Polarized electron beams at several energies would bombard a spin-exchange polarized ^{3}He target mounted in Hall A. Data would be collected with the target polarization both parallel and perpendicular to the momentum transfer, as well as with unpolarized electrons incident on a vertically polarized target. The electron and proton spectrometers would be adjusted to maintain collinear kinematics (at the center of the spectrometer acceptance) at each of four values of missing momentum, from zero to 280 MeV/c. Both pd and ppn (up to missing energies > 20 MeV) final states would be investigated.

The PAC was convinced of the feasibility of the proposed measurements. While the Committee has no doubt that the New Hampshire group could provide a polarized ^{3}He target well matched to the needs of the experiment, it notes that a target of comparable or slightly superior characteristics should become available soon in Hall A for other approved experiments. That target should be used to avoid redundant development and installation effort. The PAC encourages the groups responsible for the development of that target to participate in this Hall A collaboration experiment.

Issues: The PAC strongly endorses the desirability of (e,$e'p$) measurements probing the S' and D states. Measurements at Jefferson Lab would complement ongoing studies at Bates and NIKHEF, which are performed at lower energies, where the reaction is subject to larger final-state interaction (FSI) effects.

The PAC believes that the collinear kinematics proposed here optimize interpretability of the measurements, by confining contributions to the spin correlations A'_x , A'_z to a single polarized response function apiece. The Committee notes, however, that non-collinear contributions are introduced by the finite spectrometer acceptances, and urges the collaboration to pursue simulations that estimate the sizes of the resulting effects. Extraction of information on the ^{3}He D state will be aided by having strong sensitivity, of opposite sign, in both A'_x and A'_z, with small contributions from FSI and meson-exchange current effects.

The approximate calculations that have been performed for the ppn continuum show encouraging signs of sensitivity to the S' state in this region; the PAC trusts that the collaborators will spur theorists to pursue calculations in which the S' state contribution can be isolated more reliably.

Recommendation: Approval for 18 days with polarized beam and 6 days with unpolarized beam, to measure A'_x , A'_z , and A_y^0 at the 4 proposed values of missing momentum.

Appendix D

Experiment: E-97-001, Hall B

Spokespersons: N. A. Pivniouk, L. S. Vorobyev

Title: The Electroproduction of the $pp\pi^-$ System off the Deuteron Beyond the Quasifree Region

Scientific Rating: B–

Motivation:

Pion electroproduction from the proton, $ep \rightarrow e' n\pi^+$, has been measured over a wide range of momentum transfer, Q^2, and np invariant mass, M_{np}. The theoretical description of this process has been well developed. The theory of pion electroproduction from nuclei uses the theory of pion electroproduction from a proton and adds "corrections" due to scattering of the pion (and the nucleon) off of the remaining nucleons in the nucleus. However, there may be important multinucleon interactions contributing to the creation of the pion that are not normally included in current theoretical models. This proposal aims to measure the exclusive reaction $ed \rightarrow e'pp\pi$ over the virtual photon energy range of ~600 MeV above threshold and Q^2 range from 1.0 to 2.5 $(\mathrm{GeV}/c)^2$.

Measurements and Feasibility:

The experiment would use the CLAS detector with a deuterium target to measure the pion electroproduction cross section over the Q^2 range 1.0 to 2.5 $(\mathrm{GeV/c})^2$ and the $pp\pi$ invariant mass range, $M_{pp\pi}$ from threshold (2.12 GeV), to 2.7 GeV. They have estimated a luminosity of $L = 10^{34}\mathrm{cm}^{-2}\ \mathrm{sec}^{-1}$ and 400 hours of data collection with a 4-GeV electron beam will provide an adequate data sample (~200,000 events in the Q^2 range 0.75–1.25 $(\mathrm{GeV}/c)^2$ and ~10,000 in the Q^2 range 1.75 – 2.25$(\mathrm{GeV}/c)^2$).

The collaboration intends to compare the measured cross sections with theoretical models of nuclear pion electroproduction.

The Committee recommends that the collaboration consult with appropriate theorists and have them develop the theoretical models for describing the cross sections throughout the final state phase space. There was considerable skepticism that the experiment has adequate resolution to definitively observe the *d'* resonance.

Recommendation: Approved to take the proposed data sample with a deuterium target in collaboration with *N** program. No time is needed beyond that already approved for running CLAS under these conditions.

Proposal: PR-97-002, Hall C

Spokesperson: V. Frolov, J. Price, P. Stoler

Title: Baryon Resonance Electroproduction at High-Momentum Transfer

Motivation:

The Q^2 dependence of these resonance form factors remains of high interest in evaluating models of the baryons.

Measurement:

The experimental technique is the same as that of completed E-94-014. If the final errors match expectations, it should be adequate.

Feasibility and Issues:

The PAC would like to see the physics results and implications of E-94-014 before committing 20 additional days of beam time, in particular for a relatively modest extension in Q^2 . While it was not a factor in the decision, the collaboration should reach a conclusion if flatter acceptance with the short orbit spectrometer (SOS) out of plane is an essential component of the proposal, since moving the SOS out-of-plane would require significant laboratory resources.

Recommendation: Deferred.

Appendix D

Proposal: PR-97-003, Hall A

Spokespersons: P. Markowitz, T. Saito, T. Teresawa, G. M. Uriciuoli,

Title: Electroproduction of Hypernuclei on ^{3}He and ^{4}He

Motivation:

It is proposed to measure differential cross-sections of electro-kaon production on ^{3}He and ^{4}He. The spectra of the few body hypernuclei contain information on the hyperon-nucleon interaction. ${}^{4}_{\Lambda}\mathrm{H}(1^{+})$ and ${}^{4}_{\Lambda}\mathrm{H}(0^{+})$ have been identified in kaon induced reactions and will be studied at different momentum transfers. The anticipated ${}^{4}_{\Lambda}\mathrm{H}(0^{+})$ state, however, has a cross section which is two orders of magnitude smaller compared to the ${}^{4}_{\Lambda}\mathrm{H}(1^{+})$ state and separated by 1.05 MeV. A ${}^{4}_{\Sigma}\mathrm{He}$ estate has also been identified by kaon induced reactions and should be visible in the proposed experiment.

Only one state has been seen so far for the reactions on ^{3}He. The expected cross sections are more than one order of magnitude smaller, and an identification of these states, or even unbound resonance states, would be an important step to a more quantitative understanding of the Λ-*N* interaction.

Measurement:

The proposed experiment needs a missing mass resolution better than 0.5 MeV in order to separate the ${}^{4}_{\Lambda}\mathrm{H}(1^{+})$ and ${}^{4}_{\Lambda}\mathrm{H}(0^{+})$ states and an efficient background suppression to measure the small cross-sections.

The PAC views this as an interesting experiment but, given the demanding experimental conditions, is not ready to allocate beam time before the group has demonstrated (with the already approved experiment E-94-107) that these conditions can be met. In addition, it can be expected that data for the ^{4}He and ^{3}He reaction will be extracted from the Hall C experiment E-91-016.

Recommendation: Deferred.

Proposal: PR-97-004, Hall A

Spokespersons: J. D. T. Arrida-Neto, Yu. M. Ranyuk

Title: Study of the Generation and Decay of Fissioning Hypernuclei

Motivation:

This experiment would search for formation of very heavy hypernuclei and measure their fission lifetimes by searching for delayed electrofission of A ~200 nuclei. A by-product would be the electroproduction cross section for heavy hypernuclei. The delayed-fission lifetime of heavy hypernuclei is related to the Lambda-hyperon lifetime in such an environment, which in turn depends upon the weak interaction of Lambdas and nucleons at short distance.

Measurement:

Very thin targets of Au, Bi and U would be bombarded by 2.4 GeV electrons in a shadow-shield apparatus. The shadow shield would stop fragments from prompt fissions, which occur before the nucleus has recoiled more than a few picometers. The target would be surrounded by a barrel of mica sheets, which would then be etched after the bombardment to locate fission-fragment tracks. A shadow edge would be located, behind which tracks predominantly originate from delayed fissions of recoiling nuclei. Upstream and downstream targets would be used to measure backgrounds.

Feasibility and Issues

The measurement technique is a passive one. The PAC is concerned there is no K^+ tag to identify the fact that a hypernucleus was formed. There would not be a measurement of either the scattered electron or the correlated fission fragment pair, meaning the recoil velocity is uncertain for any compound nucleus formed. This makes it difficult to convert the measured recoil distance distribution into a lifetime distribution. A previously-approved experiment, E-95-002, does include a K^+ tag as well as time-of-flight and position measurements of both fission fragments using low-pressure MWPCs.

Recommendation: Reject.

Experiment: E-97-005, Hall B

Spokespersons: P. L. Cole, J. A. Mueller, D. J. Tedeschi

Title: Photoproduction of phi Mesons with Linearly Polarized Photons

Motivation:

This reaction has the potential to address the strange quark content of the nucleon and the nature of the vector meson-nucleon interaction. A thorough investigation of the density matrix elements in $p(\gamma,\phi)$ is needed to investigate the production mechanism at low energies where diffractive production no longer dominates.

Measurement:

The combination of the linear polarized photon facility and CLAS is well matched to determine 9 of the 11 density matrix elements. The backgrounds seem under control and the expected level of accuracy is appropriate.

Feasibility and Issues:

The analysis should be coordinated with electroproduction analysis. The proposers should investigate if polarized electroproduction is more efficient at identifying a dominant psuedoscalar exchange contribution. The collaboration must remain strongly involved in the technical issues of the polarized photon beam facility.

The PAC recommends that the various linearly polarized photon-vector meson production experiments work together to develop a coherent running plan to optimize the use of beam.

Recommendation: Conditional approval pending review by the PAC of an integrated running plan

Experiment: E-97-006, Hall C

Spokespersons: I. Sick

Title: Correlated Spectral Function (*e,e´p*) Reaction Mechanism

Scientific Rating: A–

Motivation:

This experiment proposes to measure the proton removal spectral function in C, O, Al, Fe and Au at large missing energy and momenta, where it is expected to be dominated by correlation effects, by using the inclusive (*e,e´p*) reaction. Exclusive (*e,e´p*) experiments have observed only about 70% of the single particle strength in shell model orbitals near the Fermi energy. If nuclei can be regarded as assemblies of interacting nucleons, the remaining 30% of the strength should be found at high missing energies and momenta.

Measurement and Feasibility:

The two-step processes, (*e,e´p*) followed by *(p,NN*), pion production reactions, and pair currents are expected to contribute to the (*e,e´p*) cross-section at large missing energies and momenta. The kinematics have been chosen to minimise these contributions, but it is recognized that they can not be totally eliminated. Their contribution will be calculated using the correlated Glauber approximation and subtracted from the data to obtain the yield from the correlated spectral function. The large range of nuclei and kinematics used in the experiment will allow significant checks of the theoretically estimated contributions. This feature of the proposed experiment is crucial for the measurement of the correlated spectral function, and needs to be carried out with great care.

Issues:

The location of the missing single particle strength is essential to understanding the nature of correlations and renormalizations implicit in the nuclear shell model. However, the accuracy of the spectral function extracted from the data will depend crucially on theoretically computed corrections.

Recommendation: Approved for 15 days.

Appendix D

Experiment: E-97-007, Hall C

Spokespersons: O. K. Baker

Title: Polarization Transfer in Kaon Electroproduction

Motivation:

The experiment proposes to determine the electromagnetic form factors of the Λ by measuring the polarization transfer between the incident electron and the Λ emitted in the forward direction, in the $\gamma^* p \rightarrow K^+ \Lambda$ reaction. The polarization of the emitted Λ is expected to be sensitive to its electromagnetic form factors.

Measurement:

The originality of the proposed measurement resides in the detection of both the emitted kaon and the decay proton of the Λ in the same spectrometer. This experiment fully takes advantage of the resources of the laboratory: polarized electron beam, a large acceptance spectrometer, and a high-duty factor.

Issues:

The PAC is not convinced that this experiment will determine the Λ electromagnetic form factors, but believes that spin observables will be extremely useful to improve our understanding of various strangeness production mechanisms.

The PAC believes that a measurement of polarization trasfer in kaon electroproduction should be performed at Jefferson Lab. The PAC, however, has not been convinced that the accuracy necessary to determine the polarization of the emitted Λ has been demonstrated, and would like to see a comprehensive study of the following issues:

- Monte-Carlo simulation of the determination of the components of the Λ polarization, within the acceptance of the experimental setup, and demonstration of the feasibility of the proposd measurement.
- Investigation of the effects of the efficiency and the inhomogeniety in the experimental acceptance.
- Can the electron helicity flip be exploited to cross-check the measurement of the Λ polarization.

Recommendation: Conditional approval pending the PAC's review of the answers to the aforementioned issues.

Experiment: E-97-008, Hall C

Spokespersons: O. Hasimoto, R. Sawafta, L. Tang

Title: Spectroscopic study of Λ hypernuclei beyond the *p*-shell region through the $(e,e'K^+)$ reaction

Scientific Rating: B

Motivation:

The experimenters propose a spectroscopic measurement of the hypernuclei ${}^{28}_{\Lambda}\mathrm{Al}$ and ${}^{51}_{\Lambda}\mathrm{Ti}$ in the hope of seeing the spin-orbit splitting of the Λ-hole states in the *p* and *d* shells. While previous experiments demonstrated that the Λ-*N* spin-orbit is weak, a more precise measurement would be valuable.

Measurement:

The proposed measurements are an extension of the Hall C experiment E-89-009 on *p*-shell hypernuclei. The hypernuclei will be produced by the $(e,e'K^+)$ reaction, with the e' and K^+ measured with the hypernuclear spectrometer system (HNSS) of E-89-009. The proposed incident beam energy is 1.645 GeV.

Feasibility and Issues:

The experiment is predicated on achieving a resolution of 600 keV in the short-orbit spectrometer (SOS). This has not yet been demonstrated. The resolution is crucial, as a splitting of even 600 keV between spin-orbit partners is somewhat larger than most theories predict. A careful calculation of the additional speading due to the spin-spin interaction is also important in assessing the practicality of the spin-orbit extraction. Given that the expected spin-orbit splittings in Al and Ti are similar, there is not a strong argument for exploring two nuclei at this time.

Recommendation: Conditionally approved for 15 days of ${}^{28}\mathrm{Si}$ running, pending demonstration that the HNSS can handle the needed current and achieve the required 600 keV resolution.

Experiment: E-97-009, Hall A

Spokespersons: D. Dale, A. Gasparian

Title: Measurement of $F_{\gamma^*\gamma\pi^0}$ at Low Q^2 via the Virtual Primakoff Effect

Motivation:

This experiment proposes to use the virtual Primakoff effect to measure the Q^2 dependence of $F_{\gamma^*\gamma\pi^0}$ in order to extract the $\gamma^*\gamma\pi^o$ interaction radius. A number of measurements have been made in the time-like momentum transfer region, but with limited precision. Measurements at Q^2>0.5 (GeV/c)^2 require model assumptions to extrapolate to Q^2=0 and extract the interaction radius. The proposed experiment would be a direct measurement of the slope of the form-factor near Q^2= 0. Such a measurement, if obtained with precision, would provide important new information on this fundamental form factor.

Measurement:

Modifications to the Hall A Møller polarimeter would allow measurements in the Q^2 range 0.005 – 0.035 (GeV/c)^2 by detecting the scattered electron with the Møller detector and the π^o with a new photon detector mounted in front of the Møller dipole. The modifications include removal of the third quadrupole and relocation of the first and second quadrupoles.

Feasibility and Issues:

In order for this technique to be successful, the photon detector will have to provide reasonable resolution for the identification of the π^o. There is some concern that low energy "noise" in the photon detector will significantly degrade the resolution of the detector. The PAC would like to see a careful estimate of this effect including information from test runs with a photon detector near the location required for this experiment. There is also some concern that correlated backgrounds could degrade the signal-to-noise ratio and increase the uncertainty in the interaction radius. In addition a detailed understanding of the relative normalization vs momentum transfer is required in order to extract the interaction radius. These issue should be further investigated and discussed in an update to the PAC.

Additionally the PAC would like to see the possible impact of this measurement on the value of the pion lifetime including both statistical and systematic uncertainties from the proposed experiment.

Recommendation: Conditional approval pending review by the PAC.

Experiment: E-97-010, Hall C

Spokespersons: C. E. Keppell

Title: Measurement of Hydrogen and Deuterium Inclusive Resonance Cross-Sections at Intermediate Q^2 for Parton-Hadron Duality Studies

Scientific Rating: B+

Motivation:

The objective of this experiment is to use a precisely measured set of inclusive electroproduction cross sections from hydrogen and deuterium in the resonance region to make precise tests of the parton-hadron (Bloom-Gilman) duality for the proton and neutron nucleon structure functions, and to extract higher twist matrix elements from the experimental Q^2 moments.

Measurement:

An impressive body of inclusive hydrogen and deuterium data has been gathered from experiments already run in Hall C and is being used for structure function extraction and parton-duality tests. This proposal requests 72 hours of dedicated beam time in order to extend the data base to span the resonance region and extend to high momentum transfers. With the higher-order moments of the structure functions from these data, it should be possible to estimate the higher-twist matrix elements. Duality for the neutron will be tested by subtraction of the proton from the kinematically matched deuteron data. A direct test of duality for the deuteron will also be possible.

Feasibility and Issues:

The results which this collaboration has already obtained by mining the available data for proton and deuterium running in other Hall C experiments demonstrates the importance of continuing the collection of inclusive data at every opportunity. However, the committee recognizes the value of a carefully measured set of data with controlled systematic errors taken with the specific objectives of this proposal in mind. In particular, the precision of a proton and neutron comparison will be improved by a dedicated direct experimental comparision. The low x extrapolation of the moment integrals will not pose a problem because of the appropriate x weighting of the integrands.

Recommendation: Approval for 3 days.

Experiment: E-97-011, Hall A

Spokespersons: W. Bertozzi, S. Gilad, J. Zhao

Title: Initial Exploration of Semi-Inclusive Scattering in x>1 Region ^{3,4}He($e,e'p$) Reactions

Scientific Rating: B

Motivation:

The focus of this proposal is the study of high momentum components in the ^{3,4}He wave functions using the ($e,e'p$) reaction. Assuming that these components arise predominately from short range *NN* correlations, favorable kinematics for such a study are x>1.

Measurement:

Measurements are proposed for Q^2=2 and 3 (GeV/c)^2 at four values of x>1 in antiparallel kinematics. To test theoretical calculations and assess the contributions of final state interactions and meson exchange currents, an R_L/R_T separation is proposed for ^{3}He*(e,e´p)*. At MAMI a similar systematic study of longitudinal and transverse structure functions is in progress, but the region of interest is the quasi-elastic peak. With the different kinematics and emphasis of high momentum components this proposal is thought to be complementary to both the MAMI experiment and JLab experiments E-89-044 and E-89-008.

Feasibility and Issues:

A convincing demonstration of short range correlations remains an elusive goal of ($e,e'p$) studies. Measurements in the x>1 region at high Q^2 offers interesting possibilities. However, there is considerable skepticism of the value of longitudinal/transverse separations in this kinematic regime. Data for the single nucleon response suggests that the longitudinal/transverse ratio will be quite small, in which case an accurate Rosenbluth separation will require prohibitively high precision in the cross-section determination. By focusing this experiment on the x>1 unseparated cross sections at high Q^2, this problem is avoided and data of high interest is obtained.

Recommendation: Approval for 13 days for measurements of unseparated ^{3,4}He*(e,e´p)* cross-sections.

Appendix E

Letter-of-Intent: LOI-97-001

Spokespersons: A. Aganyants

Title: High-Energy Electron Beam Interaction in Strong Field of Oriented Monocrystal

The proponents wish to investigate a non-linearity with beam intensity of energy loss in crystal channeling. Their letter, however, provides insufficient information to determine whether a full proposal is warranted.

Letter-of-Intent: LOI-97-002

Spokespersons: P. L. Cole

Title: Photoproduction of ω-Mesons off Protons with Linearly Polarized Protons

The PAC encourages the collaboration to work out a proposal to study the photoproduction of ω-mesons with linearly polarized tagged photons. However, to minimize the allocated beam time requirements, this proposal should be coordinated with the other approved experiments of vector meson production using the same experimental method.

Letter-of-Intent: LOI-97-003

Spokespersons: J. P. Chen

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

The installation of a pair of septum magnets for the Hall A spectrometers allows a decrease in the value of the scattering angle to $\theta = 6°$. This allows measurements of electron scattering data at very small Q^2 near the photon point. This letter-of-intent proposes to study the Q^2 dependence of the Drell-Hearn-Gerasimov sum rule for ^{3}He near the real photon point.

The PAC finds this LOI to be of significant interest. The data would provide information on a region extending from threshold to beyond the resonances. The comparison of these data to similar measurements planned at Jefferson Lab on the deuteron will provide an important cross check of the interpretation of these data for the understanding of the neutron spin structure function.

The PAC encourages the collaboration to submit a proposal.

Letter-of-Intent: LOI-97-004

Spokespersons: H. C. Anklin

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

The proposed measurements could provide information on the short range structure of the deuteron.

The PAC looks forward to a complete proposal including experimental details as well as calculations of the effects of final state interactions and meson exchange currents on the measured (e,$e'p$) cross sections.