Jefferson Lab
Thomas Jefferson National Accelerator Facility

REPORT OF THE 44th PROGRAM ADVISORY COMMITTEE (PAC44) MEETING

July 25 – 29, 2016

The Thomas Jefferson National Accelerator Facility (Jefferson Lab) is a national physics user facility Operated by the Jefferson Science Associates, LLC, for the U.S. Department of Energy (DOE)

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From the Director

Jefferson Lab
Thomas Jefferson National Accelerator Facility
Exploring the Nature of Matter

August 3, 2016

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Dear Jefferson Lab Users,

During the course of the year we have embarked on the program of experiments in the 12 GeV era at Jefferson Lab. In fact one of the approved, high impact experiments was completed in Hall B and a number of PAC days were completed in Halls A and D. This heightened excitement was the backdrop for the recent meeting of PAC44.

The Program Advisory Committee (PAC44) reviewed 9 new proposals, 9 letters of intent, 3 new run group proposals and 2 run group addition proposals. This review resulted in the recommendation of 5 experiments for approval. We have accepted the recommendations.

The results can be viewed at: https://www.jlab.org/exp_prog/PACpage/

As last year, the meeting was run very efficiently thanks to the efforts of the chair, Jim Napolitano. With the assistance of Susan Brown, the PAC was again able to produce its report in very short order following the meeting. I thank Jim and the PAC for their efforts to provide expert advice to the Lab.

Sincerely,

Hugh Montgomery
Laboratory Director

From the Chair

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July 29, 2016

Robert D. McKeown
Deputy Director for Science
Jefferson Lab

Dear Bob,

This letter transmits the findings and recommendations of the 44th Jefferson Laboratory Program Advisory Committee (PAC44). The Committee met July 25-29, 2016, and considered 15 proposals for new beam time (or other lab resources), two parallel run group additions, and nine letters of intent. It was a busy week, but we were pleased to see such enthusiasm in the nuclear physics community for the continued pursuit of high quality science at Jefferson Lab.

Written reports on all of the proposals and letters of intent were prepared and reviewed by the Committee before we adjourned. Four proposals were approved outright with an A or A^- rating, and one of these (a search/confirmation for the LHCb pentaquark) was deemed to be in the "High Impact" category. Two proposals were "C1" Conditionally Approved because we felt the laboratory needed to consider their technical requirements more carefully, and the beam dump experiment was "C2" Conditionally Approved because we would like to see them carry out some onsite measurements of the neutron flux when the accelerator is running. Seven proposals were deferred, and one was rejected.

PAC44, once again this year, held proposals and presentations to a very high standard. We realize that we are raising the bar for the proposers, but we feel this is necessary now that a large backlog of approved experiments exists, and resources continue to be scarce. We do not want to discourage users from submitting proposals, and in fact we strongly encourage proposals to study groundbreaking science that are well thought out and defended, but we want it understood that the PAC is looking for all around excellence in future submissions.

This was the first PAC to receive and act on Run Group proposals, and I believe it worked out very well. Spokespersons packaged their physics for CLAS12 into coherent sets of experiments that shared running time. One of these was approved outright, one was deferred because of the lack of clarity on several technical aspects, and one was deferred because we decided it did not represent a uniquely new run plan. We strongly encourage continued use of the Run Group scheme for future proposals to use CLAS12, SoLID, and GlueX.

An issue was raised regarding our approval of long beam time allocations for CLAS12, without scrutinizing the precise relationship between beam time and physics goals. Indeed, such scrutiny would be very difficult for a

PAC, especially in cases where the precision on a final result requires extensive analysis. Furthermore, this would end up crossing the line to acting as a scheduling group, rather than a PAC. However, we want to make the point that long beam time allocations for run groups, must be seen as flexible in their scheduling. Indeed, we think that it is unlikely that a long run will in fact see all of its beam time before jeopardy sets in.

We were struck by the number of proposals that want to study the EMC effect in various ways. In the more than 30 years since this effect was first discovered, much new data has been collected. However, as indicated in the most recent Long Range Plan (LRP) for Nuclear Science, a full understanding remains elusive. Nevertheless, Jefferson Lab is obviously the premier laboratory for making new measurements to sort out this physics. Indeed, the LRP notes that JLab data indicate that the EMC effect depends on the local nuclear density. We suggest that the community of scientists who want to pursue the EMC effect, convene themselves (perhaps at a Jefferson Lab workshop) and form a lab-wide strategy for tackling this problem. Future proposals should be tied to this strategy.

Finally, we would like to make a comment on the Letters of Intent. Among the nine that we reviewed, there was an enormous variation in quality and preparedness. Indeed, in some cases we felt the Letters did not meet minimal scientific standards for citation of previous work. We suggest that the process for submitting a Letter of Intent is too lax, and that future PACs have a greater authority to recommend whether a Letter should, or should not, stand as a record of "claim" to some piece of science. We also request that future proposals, and Letters of Intent, be required to list any prior Letters that have overlapping science.

On behalf of PAC44, I congratulate and thank you and your colleagues on continuing to build an outstanding nuclear physics program at Jefferson Lab. We are also grateful for the opportunity to contribute to the decision making process for allocating precious beam time.

The PAC is at your disposal for any other information or assistance we can give you.

Best wishes,

Jim Napolitano
PAC44 Chairperson
Professor and Department Chair
Temple University Physics

Introduction

The Jefferson Lab Program Advisory Committee held its 44th meeting from July 25th through July 29th, 2016. The membership of the committee is given on pages 45-46. In response to the charge (page 47) from the JLab Director, Dr. Hugh Montgomery, the committee reviewed 3 returning C2 proposals, 9 new proposals, 1 returning C2 run group, 2 new run groups (Hall B), 3 run group additions, and 9 Letters of Intent.

Recommendations

PAC 44 SUMMARY OF RECOMMENDATIONS								
NUMBER	CONTACT PERSON	TITLE	HALL	DAYS REQUESTED	DAYS AWARDED	SCIENTIFIC RATE	PAC DECISION	TOPIC*
C12-15-001	N. Sparveris	Measurement of the Generalized Polarizabilities of the Proton in Virtual Compton Scattering	C	17	8	A-	Approved	2
C12-15-008	S. Nakamura	An isospin dependence study of the Lambda-N interaction through the high precision spectroscopy of Lambda hypernuclei with electron beam	A	28	28	A	Approved	5
C12-15-005	E. Long	Measurements of the Quasi-Elastic and Elastic Deuteron Tensor Asymmetries	C	44.3	44.3	A-	C1	5
PR12-16-001	M. Battaglieri	Dark matter search in a Beam-Dump eXperiment (BDX)	A	285		C2	C2	6
PR12-16-002	V. Sulkosky	Measurement of Parity-violation in the Resonance Region (PVRES) for the Proton and Deuteron	C	28			Deferred	3
PR12-16-003	G. Huber	Determining the Pion Form Factor from Higher Q^2, High -t Electroproduction Data	C	5			Deferred	2
PR12-16-004	O. Hen	The CaFe Experiment: Short-Range Pairing Mechanisms in Heavy Nuclei	C	4			Deferred	5
PR12-16-005	J. Boyce	PHADE/ACES: A PHosphorescent DEtector and A Chameleon Experimental Search	LERF				Rejected	6
PR12-16-006	S. Riordan	The EMC PVDIS Experiment: A Constraint on Isovector-Dependent Nuclear Modification Effects Using Parity-Violating Deep Inelastic Scattering	A	71			Deferred	5
PR12-16-007	Z. Meziani	A Search for the LHCb Charmed “Pentaquark” using Photoproduction of J/Psi at Threshold in Hall C at Jefferson Lab	C	11	11	A	Approved (High Impact)	1
PR12-16-008	T. Satogata	ER@CEBAF: A Test of 5-Pass Energy Recovery at CEBAF	Cebaf	12		P	C1	
PR12-16-009	D. Keller	Longitudinal and Transverse Target Correlation Asymmetries in Wide Angle Compton Scattering	C	25		Deferred	Deferred	4
PR12-16-010	A. D'Angelo	A Search for Hybrid Baryons in Hall B with CLAS12	B	100	100	A-	Approved	1
PR12-16-010A	D. Carman	Nucleon Resonance Structure Studies Via Exclusive KY Electroproduction at 6.6 GeV and 8.8 GeV	B					1
PR12-16-010B	L. Elouadrhiri	Deeply Virtual Compton Scattering with CLAS12 at 6.6 GeV and 8.8 GeV	B					4

NUMBER	CONTACT PERSON	TITLE	HALL	DAYS REQUESTED	DAYS AWARDED	SCIENTIFIC RATE	PAC DECISION	TOPIC*
PR12-16-011	R. Dupre	Tagged EMC Measurements on Light Nuclei	B	45			Deferred	5
PR12-16-011A	Z. Meziani	Partonic Structure of Light Nuclei	B			[redacted]	[redacted]	5
PR12-16-011B	W. Armstrong	Tagged Deeply Virtual Compton Scattering Off Light Nuclei	B					5
PR12-16-011C	K. Hafidi	Other Physics Opportunities with the ALERT Run Group	B					5
C12-15-004	S. Niccolai	Deeply virtual Compton scattering on the neutron with a longitudinally polarized deuteron target	B	73			Deferred	4
C12-15-004A	S. Kuhn	DIS on Longitudinally Polarized Deuterium	B			[redacted]	[redacted]	3
C12-15-004B	S. Pisano	Semi-Inclusive Deep Inelastic Scattering on a longitudinally polarized deuterium	B					4

Topic*

1 The Hadron Spectra as Probes of QCD
2 The Transverse Structure of the Hadrons
3 The Longitudinal Structure of the Hadrons
4 The 3D Structure of the Hadrons
5 Hadrons and Cold Nuclear Matter
6 Low-Energy Tests of the Standard Model and Fundamental Symmetries

C1=Conditionally Approve w/Technical Review
C2=Conditionally Approve w/PAC Review

PARALLEL PROPOSAL SUMMARY				
NUMBER	**CONTACT PERSON**	**TITLE**	**HALL**	**TOPIC***
12-06-108B	M. Kunkel	Transition Form Factor of the eta' Meson with CLAS12	B	
12-06-109A	S. Niccolai	Deeply Virtual Compton Scattering on the Neutron with a Longitudinally Polarized Deuteron Target	B	

Proposal Reports

PR12-16-001

Scientific Rating: N/A

Recommendation: C2

Title: "Dark matter search in a Beam-Dump eXperiment (BDX) at Jefferson Lab"

Spokespersons: Marco Battaglieri (contact), Gordan Krnjaic, Eder Izaguirre, Elton Smith, Marzio De Napoli, Raffaella De Vita, Andrea Celentano

Motivation: The BDX proposal aims to set up a light mass dark matter (LDM) experiment in beam-dump mode to detect LDM particles in the MeV to several GeV range with a $1m^3$ segmented CSI (Tl) scintillation detector. The most promising LDM scenario is an interaction with the standard model through a dark photon, A'. Unlike in many A' searches, where the A' is detected through its visible decay mode, BDX looks at A' hidden (or invisible) decays, i.e. radiative pair-production of LDM (χ), which then interacts in the detector. Two classes of interactions are considered: a) elastic scattering of χ off atomic electrons, and b) inelastic scattering of χ in the detector with subsequent de-excitation and emission of an e^+e^- pair (GeV scale). It may also be possible to observe χ-nucleon scattering, but this would result in a very small signal with large neutrino and cosmogenic backgrounds that limits access to MeV mass scales.

There is an attempt to resolve the g-2 anomaly (3.5σ discrepancy between theoretical prediction and experimental observation of the muon's anomalous magnetic moment). It is noted that conventional A' scenarios, where the A' decays into known particles (visible decays), are ruled out as explanations of the g-2 anomaly, but regions of parameter space where visible A' decays are strongly suppressed are still viable.

Measurement and Feasibility: The experiment can be performed about 20 m downstream of the beam dump of Hall A. It is argued that 20 m is enough to shield against charged particles and neutral hadronic particles. BDX needs construction of a new building and excavation to house the segmented CSI(Tl) scintillation detector and associated veto counters. The estimated cost for the new building is about $1.5M. BDX is planned to run in parasitic mode (at least in the first phase of the experiment). The request is for 285 days (41 weeks) of beam time to collect 10^{22} EOT over a period of 4 years.

Issues: Among the many issues raised by the TAC, the committee is particularly concerned with background, which is always a central concern in dark matter experiments: it needs to be minimized, and the residual background needs to be understood, often times with detailed simulations. The background studies for BDX must include neutron propagation of high energy neutrons (up to order 10 MeV), possibly with experts from the neutron scattering community, and it should be investigated whether pulse shape discrimination of neutrons with a fast detector (SiPM) on a slow crystal (CsI(Tl)) is feasible, considering that there may appear a lot of noise on the recorded waveforms.

While simulations are an essential tool in understanding background conditions, they are not sufficient to design an experiment. The BDX collaboration is therefore encouraged to think more about benchmarking their simulations with measurements on site.

The committee would like to see a more complete design of the new facility that includes shielding, as well as a discussion of detector optimizations.

Since BDX will run in parasitic mode, the committee requests that this experiment will not impact the NP program at JLab. If dedicated beam time, or other resources, become necessary, we recommend that this experiment be resubmitted to the PAC at that time.

Summary:
The committee is excited about the physics case, and encourages the BDX collaboration to optimize their experiment in accordance with the many comments received from the TAC and the PAC.

PR12-16-002

Scientific Rating: N/A

Recommendation: Deferred

Title: "Measurement of Parity-violation in the Resonance Region (PVRES) for the Proton and Deuteron"

Spokesperson: N. Kalantarians, M.M. Dalton, C. Gal, V. Sulkosky

Motivation: The goal of the experiment is determination of the gamma Z interference structure function in the resonance region, including its isospin dependence (proton/neutron), which serves several physics purposes: (a) input for dispersive calculations of the gamma Z box graph contribution, (b) input to similar radiative corrections to PVDIS with SOLID and other PV experiments, (c) improved modeling of neutrino-nuclear interactions in the resonance region to support neutrino oscillation experiments, and (d) novel studies of quark-hadron duality.

Measurement and Feasibility: The experiment aims at a measurement of a parity-violating single spin beam helicity asymmetry for proton and deuteron targets in the kinematic range of $W > 2$ GeV and $Q^2 = 0.25 - 0.6$ GeV^2. The experiment uses the Hall C HMS and SHMS spectrometers to detect the scattered electron at a 4.4 GeV beam energy.

Issues: The quantitative impact of this measurement on the reduction of the theory uncertainty of the Qweak error stemming from the gamma Z box graph amplitude is promising but has not been demonstrated. The quantitative impact for the other fields of physics interest given in the proposal has not been shown either. The gamma Z interference structure function in the kinematical region has a potential physics interest of its own and might help to improve the MOLLER systematic uncertainty stemming from background pollution of the signal.

Summary: The PAC finds the proposal potentially interesting and encourages the authors to explore the impact of the proposed measurements quantitatively in collaboration with all involved theory groups and recommends that they also explore possible connections of the electroweak properties of the involved resonances with the measured gamma Z interference structure function.

PR12-16-003

Scientific Rating: N/A

Recommendation: Deferred

Title: "Determining the Pion Form Factor From High Q^2, High –t Electroproduction Data"

Spokespersons: G. Huber, D. Gaskell, T. Horn

Motivation: Studies of the pion form factor at high Q^2 constitute a flagship of the physics program with the JLab 12GeV upgrade. To obtain data for F_π to Q^2 values of at least several GeV^2 is a worldwide unique capability of JLab. Such data offer important tests of models and possibly also their interplay with predictions based on QCD perturbation theory.

Measurement and Feasibility: In lieu of a pion beam one uses exclusive electroproduction of pions, exploiting processes with a pion exchanged in the t-channel. At low t, near the pion mass pole, the longitudinal cross section becomes approximately proportional to the square of the form factor. To obtain reliable extractions of F_π it then becomes key to demonstrate their independence of t. Thus one performs measurements at two or more different values of t and compares the resulting F_π. Another tool for validation is offered by the ratio of negative and positive pion longitudinal production cross sections. This should be close to unity at small -t where the t-channel pole diagram dominates. Both techniques, the extraction of F_π at different t and the measurement of the π^-/π^+ ratio, are planned to be used in this experiment. For this purpose, the proponents have devised a clever plan for optimization of the kinematics of the previously approved E12-06-101 and E12-07-105 experiments.
Issues: There are no major technical issues. The measurements planned at Q^2=8.5 GeV^2 would require somewhat non-standard beam energies, which however does not appear to constitute a major problem, especially as an ever better understanding of the machine will emerge over the coming years. As discussed in the proposal, the measurements at Q^2=8.5 GeV^2 will need to be carried out at a relatively large $-t_{min}$=0.55 GeV^2. The required π^-/π^+ ratio validation can however only be feasibly performed at Q^2=6 GeV^2. So one needs to rely on a weak Q^2 dependence of the ratio at fixed -t, as in fact was observed in earlier experiments.

Summary:
The PAC applauds the work of the collaborations in optimizing the use of beam time to improve the measurement of the pion form factor. We are impressed to see that with the optimized setting measurements of F_π in the E12-06-101 experiment now appear possible out to Q^2 values of 6 GeV^2 with a more economical use of beam time.

The PAC confirms the high-impact status of the measurements of F_π to Q^2=6 GeV^2 and encourages the Lab to schedule the E12-06-101 component of this proposal accordingly. We recommend that the emphasis for the remaining beam time approved for E12-06-101 and E12-07-105 be further measurements of separated pion cross sections over a range of Q^2, x and, -t.

While the PAC does believe that a data point for F_π at Q^2=8.5 GeV^2 would be very valuable as it would extend our knowledge of F_π further into uncharted territory, it does not think that the case made in the present proposal is sufficiently strong to justify additional (high-impact) beam time. It does not seem that a measurement with an uncertainty of about 10% would help significantly in distinguishing among models, at least not more than the data at Q^2=6 GeV^2 would already do. Neither would it shed much light on issues such as the possible onset of perturbative QCD (especially as the status of perturbation theory at Q^2=8.5 GeV^2 is theoretically unclear). We thus do not recommend granting the additional 120 hours of beam time requested in this proposal.

The PAC encourages the collaborations to continue to develop new ideas for obtaining a more precise measurement of F_π at values of Q^2 beyond 6 GeV^2.

PR12-16-004

Scientific Rating: N/A

Recommendation: Deferred

Title: "The CaFe Experiment: Short-Range Pairing Mechanisms in Heavy Nuclei"

Spokespersons: Douglas Higinbotham, Or Hen (Contact Person), Larry Weinstein, Erez Cohen

Motivation: This proposal aims to measure (e,e'p) to gain a quantitative understanding of the nucleon-nucleon pairing mechanism in heavy nuclei. It is pretty well established at this point that almost all high-momentum protons in nuclei have a correlated partner, and that that partner is almost always a neutron. That seems to be true for symmetric heavy nuclei, but also for asymmetric heavy nuclei (with unequal numbers of neutrons and protons). And it appears that this unlike-fermion pairing is similar to pairing in two-component ultra-cold atomic gases, which is striking considering the difference of >20 order of magnitude in density. Although the general behavior is known, details of how protons pair in nuclei has not been systematically studied yet.

The measurement proposed here is among a suite of measurements to gain deeper understanding of the NN short range correlations. The proposed measurement may have implications on a number of other issues in astro, nuclear and particle physics. This would also have an impact on the 12 GeV program at JLab, by providing complementarity to other experiments outlined on the cover sheet. For example, while E12-10-108 (a "classic" EMC effect measurement) will extend understanding of EMC-SRC correlation, this proposal promises to disentangle EMC and SRC correlation by studying how the EMC effect and the SRC ratios change (separately) from 40Ca (Z=N=20) to 48 Ca (8 extra neutrons). Furthermore, inclusive (e,e') measurements on 48Ca/40Ca are sensitive to both high-momentum protons and neutrons, in (e,e'p) one is sensitive to the high-momentum protons only.

Measurement and Feasibility: The experiment could be performed in Hall C using standard equipment and targets.

Issues: While the area of induced correlations due to short range part of the nucleon-nucleon interaction is of interest, the PAC found the proposal lacking in details. For example, a future proposal should give concrete theoretical calculations of *how* SRC affect physics. Rather than state that SRC pairs will affect neutrino-nucleus interactions, how does the counting of pairs discriminate among modern theories of the nuclear interactions? What are the quantities that theorists could calculate using modern nucleon interactions (e.g., AV18 plus three nucleon potentials and others) and experimentalists could measure that would distinguish among the interactions on the market?

Physics by analogy is not useful in setting up a falsifying experiment. While the nucleus is a quantum many-body system, it is not an atomic system. It should be noted that theorists are concerned with the claim that there should be a k^{-4} behavior in heavy nuclei. See Weiss et al., PRC 92, 054311 (2015).

Summary:
While the PAC believes that such an experiment could be of value in the future, at the present time the proposal before us is not sufficiently discriminating or detailed.

PR12-16-005

Scientific Rating: N/A

Recommendation: Reject

Title: "A PHosphorescent Afterglow DEtector and A Chameleon Experimental Search"

Spokesperson: James R. Boyce

Motivation: Quintessence models are designed to address both the cosmological constant problem (by extreme fine-tuning) and the coincidence problem (why it is comparable to the matter density today). The quintessence field must be extremely weakly coupled, as implied by experiments searching for a fifth force and violations of the equivalence principle. Chameleons are introduced as a way to avoid those constraints by having a mass depending on the local matter density, so that in matter it is very massive and in vacuum it is very light.

Measurement and Feasibility: A laser shines light into a chamber with a strong magnetic field (B = 1.7 T) in which photons oscillate into chameleons which due to their large effective in-medium mass will be trapped. Turning off the laser will leave an afterglow to be detected by a low noise PMT. Laser polarization aligned or perpendicular to B can probe pseudoscalar and scalar chameleons. However, couplings β_M of order unity to matter, as generally expected from string theory, cannot be tested in afterglow type of experiments, as otherwise the Chameleon decay rate would be too small compared to the dark rate (B = 0).

Issues: The proposal does not provide many experimental details. Rather, it builds on a publication by the GammeV Collaboration to which the proposal refers. This publication excluded β_M values between 5×10^{11} and 10^{13}, leaving an unexplored region of values between 10^{13} and 10^{15} (where rigorous constraints from precision electroweak physics set in). However, a follow-up publication by the GammeV Chameleon Afterglow Search (CHASE) excluded all the remaining parameter space that this proposal could probe. In his presentation, but not in the written proposal, the spokesperson voiced criticism regarding the CHASE result, but his remarks did not convince the PAC that the CHASE result should be dismissed.

Summary:
The PAC does not recommend approval of the requested laboratory resources.

PR12-16-006

Scientific Rating: N/A

Recommendation: Deferred

Title: "The EMC PVDIS Experiment: A Constraint on Isovector-Dependent Nuclear Modification Effects Using Parity-Violating Deep Inelastic Scattering"

Spokespersons: Seamus Riordan, Rakitha Beminiwattha, and John Arrington

Motivation: The goal of this measurement is to explore flavor-dependent nuclear medium modification effects on quarks using parity-violating deep inelastic scattering on a ^{48}Ca target. In principle, PVDIS will be able to unravel the flavor dependence of the EMC effect. This would be both intrinsically interesting nuclear physics and extremely valuable in understanding neutrino DIS and Drell-Yan processes on heavy targets.

Measurement and Feasibility: The collaboration proposes to use a new 12% RL ^{48}Ca target and the SOLID apparatus in Hall A. Running an 80 μA polarized electron beam for a total of 71 PAC days would allow a measurement of the parity violating asymmetry A_{PV} with 0.7-1.3% statistical uncertainty over the range $0.2 < x < 0.7$.

Issues: Although the proposal will use the SOLID detector and preexisting beam line and polarimeters, a new ^{48}Ca target will be very expensive. In the response to concerns in the TAC report about increased neutron fluxes on Calcium, the proponents report site-boundary rates that would be comparable to CREX. The integrated dose to the SOLID apparatus itself is also of some concern. While this is not a show-stopper, this high intensity run would have an impact on the operational lifetime of the SOLID apparatus.

Summary:
The PAC finds the proposed physics to be interesting but believes that information from experiment E12-10-008 (^{48}Ca/^{40}Ca) should be available before committing the substantial beam and financial resources necessary for this experiment.

PR12-16-007

Scientific Rating: A – High Impact

Recommendation: Approved

Title: "A search for the LHCb Charmed 'Pentaquark' using Photoproduction of J/ψ at threshold in Hall C at Jefferson Lab"

Spokespersons: Z.-E. Meziani (contact), S. Joosten, M. Paolone, E. Chudakov, M. Jones

Motivation: The proposal aims to search for near-threshold resonances in the J/ψ p system through J/ψ photo-production, following the recent LHCb finding of hidden charm resonances consistent with pentaquarks. The idea is to probe the resonant nature of these states by investigating in a timely and fast manner the energy region just above the J/ψ threshold in this very clean channel.

Photoproduction has the important advantage that the triangle singularity which might explain the signal seen in the LHCb data, cannot occur in photoproduction. If the respective states are observed in photoproduction, this would be clear evidence that these states do indeed exist as genuine resonances.

Together with the other longer experiments approved (E12-12-001) or proposed (LOI-12-16-004) covering this subject, JLab will be in the unique position to confirm or refute the discovery. With the high luminosity achievable, this experiment could give a fast answer.

Measurement and Feasibility: The experiment requests 11 days. It will be performed in Hall C, using bremsstrahlung photons from the 11 GeV electron beam, and a 15cm liquid hydrogen target. The electron-positron pairs from the J/ψ decay will be measured in the HMS and SHMS spectrometers, respectively. The beam time is split. In the first 2 days a setting will be used which is well suited for an experimental investigation of t-channel background, while the main part of the experiment (9 days) will be run in a setting optimized for the s-channel production of the possible pentaquark states and for a reduced background from t-channel J/ψ production. Signals should already be visible for the theoretical coupling of 1.3% for the LHCb pentaquark to J/ψ p with a photon coupling based on recent models.

Standard equipment will be used, with basic calibrations, making the experiment technically straightforward. Only the copper radiator will have to be designed and implemented. This does not appear to be a serious obstacle.

Issues: None

Summary:
The PAC considers this experiment as a high impact proposal. Proving that the states observed by LHCb and interpreted as pentaquarks do really exist is considered to be of large impact.

PR12-16-008

Scientific Rating: Pass

Recommendation: C1

Title: "ER@CEBAF: A Test of 5-Pass Energy Recovery at CEBAF"

Spokespersons: T. Satogata and F. Meot

Motivation: This proposal aims to explore Energy Recovery LINAC technology at high energy and in 5-pass operation. This is an important proof of principle for proposed future electron-ion colliders including eRHIC and LHeC as well as possible FELs, electron cooling devices and synchrotron radiation sources. CEBAF is a unique facility for this experiment as it provides high enough energy to test the effects of synchrotron radiation and multiple pass behavior. However, this experiment cannot test high-current capabilities.

Measurement and Feasibility: Two permanent pieces of equipment would be added to CEBAF, a new path-length chicane in the west arc (after the south linac) and a new low energy beam dump at the end of the south linac. New accelerator optics would be developed and new beam diagnostic equipment would be installed. The measurement would proceed in three phases: half-pass, one-pass and then five-pass acceleration and deceleration. The measurement seems well planned and the goal achievable.

Issues: The four-month installation period may be significantly underestimated. The 2003 single-pass ERL measurement took two weeks and was not complete enough to be published, although a PhD thesis did result. Therefore, 18 days of beam time to do both 1-pass and 5-pass ERL may be insufficient to achieve the definitive demonstration of multi-pass ERL proposed. We note that this measurement would operate in single-user-mode and thus have three times the impact on the rest of the JLab program.

Summary:
Because of the potential for major impact on proposed EIC designs, the PAC is very interested in seeing this experiment performed, but lacks the accelerator expertise to make a detailed judgment on technical details of the proposal. We recommend conditional approval with a panel of accelerator physics experts convened to review the proposal to validate the methods and to identify the appropriate resources (accelerator time and equipment costs). The PAC strongly encourages JLab management to identify additional resources that will minimize the negative impact on the JLab nuclear physics program.

PR12-16-009

Scientific Rating:

Recommendation: Deferred

Title: "Longitudinal and Transverse Target Correlation Asymmetries in Wide Angle Compton Scattering"

Spokespersons: D. Day, D. Keller (Contact person), J. Zhang

Motivation: Real Compton Scattering off a proton (RCS) is a fundamental and basic process which, at high energies, should be explained in terms of photon-quark interactions. Until recently the mechanism behind RCS in the regime of $\sqrt{s}$ = 5-10 GeV was not understood. Recent measurements have shown that these data cannot be described by pQCD models involving the scattering of three valence quarks, but the dominant mechanism could be the handbag model with the photon scattering off a single quark. The proposed measurements aims at disentangling the existing handbag mechanisms (CQM, Regge, SCET and GPD) that have been proposed to describe asymmetries previously measured in Wide Angle Compton Scattering (WACS). In particular the double longitudinal spin asymmetry K_{LL}, related to the helicity transfer from the photon to the scattered proton, is surprisingly large and stable with respect to the photon center-of-mass scattering angle. In some models K_{LL} equals the spin asymmetry A_{LL} relative to the helicity of the photon and the initial proton, while in others these two quantities are different. The measurement of A_{LL} proposed here should help in discriminating between different scattering mechanisms.

Measurement and Feasibility: This proposal requests 34 days to measure the initial state helicity correlation asymmetry A_{LL} in WACS on a polarized proton target at photon energies of 4 GeV (s = 8 GeV2 and θcm = 90°) and 8 GeV (s =15 GeV2, θcm = 90°, θcm = 120°). In these regions all Mandelstam variables are rather large and the handbag mechanism is supposed to hold. In particular 120 degrees is one of the angles at which K_{LL} has been measured to be very large. Also the A_{LS} asymmetry, which requires a transversely polarized proton target, will be measured at 8 GeV and θcm = 120°.

Issues: The PAC commends the PR12-16-009 collaborators on the development of two new photon source designs that move the electron dump away from the polarized target. However, the specifics of the dump design, cost and heat/radiation load to associated equipment in the hall has not been estimated. This needs to be completed in order to fully evaluate the proposal. The PAC recommends working closely with lab management while optimizing the photon source beam and dump design.

Summary:
The PAC considers investigations into the mechanisms behind WACS to be very valuable. We encourage the collaborators on the approved E12-14-006 experiment and the proposed PR12-15-003 and PR12-16-009 to unify their efforts and submit a new proposal with a fully developed photon source, beam dump, polarized target and raster design. Ideally this proposal would encompass the primary physics motivations from all three proposals, with an emphasis on the verification that $A_{LL} = K_{LL}$ and the measurement of A_{LL} at large angles (120 degrees) and in the kinematic regime that will allow interpretation within the handbag framework.

We recommend that the laboratory provide resources for a workshop focused on developing the physics case, as well as an optimized compact photon source and beam dump, organized jointly by the spokespersons of the PR12-16-009, PR12-15-003, and E12-14-006 proposals.

PR12-16-010

Scientific Rating: A^-

Recommendation: Approved

Title: CLAS12 Run Group K: Quark-gluon confinement & Strong QCD
"Search for Hybrid Baryons in Hall B with CLAS 12"
"Nucleon Resonance Structure Studies Via Exclusive KY Electroproduction at 6.6 GeV and 8.8 GeV"
"Deeply Virtual Compton Scattering with CLAS12 at 6.6 GeV and 8.8 GeV"

Spokespersons: A. D'Angelo, S. Carman, L. Elouadrhiri (contact persons)

Motivation: The baryon spectroscopy parts of the run group proposal aim at identifying baryon resonances and measuring their Q^2 dependence. While the first proposal will address the mass range from W=1.8 GeV to 3 GeV approaching very small Q^2 (Q^2 = 0.05-2 GeV), the second proposal covers W=1.6 GeV to 3 GeV looking at the higher Q^2 -range (2 to 7 GeV^2) which expands the approved CLAS12 N* program (E12-06-108A covering Q^2 from 5 to 12 GeV^2) towards lower Q^2 values. This data will allow the identification of new baryon resonances, the confirmation of baryon resonances, including the new states found around 1900 MeV which were recently identified based on new high statistic photoproduction data. One special interest of the first proposal is to search for hybrid baryon resonances expected by lattice QCD in addition to the search for "usual" resonances. The measurement of the Q^2-dependence of the different observed states provides at the same time information on the nature of the states. For hybrids a distinctively different low Q^2-evaluation of their electrocouplings is expected due to the additional gluonic component in the wave function. The Q^2 evolution measured for the observed baryon resonances provides interesting information on the structure and the relevant degrees of freedom over distance scale (hybrid, meson-baryon, 3q). Having electroproduction data at different Q^2 available for partial wave analyses (PWA) has another important advantage: While resonance masses, total and hadronic partial widths remain the same for different Q^2 bins, the relative strength of the different resonant and background amplitudes changes. This provides important additional constraints for the PWA. While the data taken will include many different final states, proposal one discusses in detail the p π^+ π^- and KY-electroproduction, proposal two KY-electroproduction.

The third proposal addresses the topic of Deeply Virtual Compton Scattering and meson production which offer fundamental probes of nucleon structure and QCD. Measurements of their cross sections are cornerstones of the 12 GeV physics program. The presently proposed measurements build on the program approved for CLAS12 with 11-GeV running. The plan is to add measurements at 6.6 GeV and 8.8 GeV beam energy. Having data at different energies would allow one to separate the "DVCS squared" and "DVCS*Bethe-Heitler" contributions to the cross section harmonics, thanks to their different dependencies on energy. Since the two quantities also probe different aspects of the Compton form factors it becomes possible to disentangle the real and imaginary parts of the latter. This can be done in a model-independent way. With input from models, and using extrapolation in the skewness variable, one may then draw conclusions on the size of the "d_1-term", a fundamental quantity in nucleon structure related to a coefficient in the matrix element of the energy-momentum tensor that provides insight into the pressure inside a nucleon. In the case of deeply virtual meson production, extending the measurements to lower beam energies will allow a Rosenbluth-type separation of the longitudinal and transverse polarization parts of the cross section. This is important, as the longitudinal part, in particular, may probe model calculations.

Measurement and Feasibility: The measurement will be performed at two electron energies 6.6 GeV (50 days) and 8.8 GeV (50 days) using longitudinally polarized electrons (P > 85%) and a liquid hydrogen target. The measurements will use the forward tagger (FT) so that the electron can either be measured in the FT or in CLAS12 (2.5°-35°). For the baryon spectroscopy proposals the forward tagger allows the measurement to Q^2 as small as 0.05 GeV^2 for the lower beam energy. The two energy settings are in this case needed to avoid acceptance holes in the Q^2 -range. Differential cross-sections, transverse-transverse and transverse-longitudinal interference cross sections as well as induced and recoil polarizations (KY) will be measured. Extensive and convincing MC-studies have been performed and sensitivity studies for the predicted hybrid-states were done. For a detailed interpretation of the Q^2-dependence further theory input, if possible from lattice, would be very valuable.

In the DVCS measurements the Forward Tagger is used for photon detection. Studies of backgrounds and of apparatus compatibility have been carried out and do not give rise to any concerns.

Issues: We feel that the systematic uncertainties quoted in the DVCS-proposal are fairly ambitious, being significantly lower than those achieved in CLAS so far. However, the PAC does not view this as a major concern since it is likely that much additional experience on dealing with systematics will be gained in forthcoming running with CLAS12 and in new detector studies. Furthermore, even with somewhat larger systematic uncertainties a strong physics case remains, keeping in mind that the present theoretical models themselves carry large uncertainties.

Summary:
The PAC is excited about the new possibilities 6.6 GeV and 8.8 GeV running would offer for baryon spectroscopy and DVCS. The baryon spectroscopy program discussed is clearly the needed continuation of the baryon spectroscopy program at CLAS with the clear potential to find new and maybe also hybrid baryon resonances. The PAC considers this a very interesting future program. For the DVCS studies, the combination of measurements at 6.6 GeV and 8.8 GeV with those at 11 GeV will allow comprehensive extractions of the Compton form factors. The PAC strongly suggests a run plan that allows to get preliminary results also with partial beam time including both electron energies.

PR12-16-011

Scientific Rating: N/A

Recommendation: Deferred

Title: ALERT Run group: 12-16-011:

"Nuclear Exclusive and Semi-inclusive Measurements with a New CLAS12 Low Energy Recoil Tracker"

"12-16-011A, Partonic Structure of Light Nuclei"

"12-16-011B: Tagged Deeply Virtual Compton Scattering On Light Nuclei"

"12-16-011C, Other Physics Opportunities with the ALERT Run Group »

Spokespersons: Raphael Dupre, Nathan Baltzell, Kawtar Hafidi, Gabriel Charles, Gail Dodge, Mohammad Hattawy, Michael Paolone, Zein-Eddine Meziani, Whitney Armstrong

Motivation: This run group aims to enhance the CLAS12 apparatus with a large acceptance drift chamber/hodoscope detector capable of distinguishing light recoil nuclei. This creates a run group that will use information on the spectator kinematics for a wide range of physics.

Measurement and Feasibility: The proposal is to replace the central detector around the CLAS12 target with a low energy recoil detector consisting of a drift chamber and a scintillator hodoscope located inside the drift chamber volume. The combination of time-of-flight and low density tracker should have better ability to distinguish light recoil nuclei and, unlike a TPC, would allow triggering to substantially reduce data rates. The lead proposal measures the EMC effect as a function of recoil momentum and x for the tagged processes: ^{2}H(e; e'p)X, ^{4}He(e; e' ^{3}H)X and ^{4}He(e; e' ^{3}He)X . Forty five days (20 on ^{4}He, 20 on ^{2}H and 5 for commissioning) are requested with the CLAS12 detector.

Proposal PR12-16-011A proposes to extract the ^{4}He GPD, via DVCS, e ^{4}He —> e ^{4}He gamma and DVMP, e ^{4}He —> e ^{4}He phi, processes. The final ^{4}He is detected. It is a particularly clean case, as the ^{4}He is a spin 0 state and it has only one GPD, H_A . Both its real and imaginary part can be extracted by measuring the longitudinal beam spin asymmetry, A_{LU}. Such a measurement has already been performed at JLab, with only a few experimental points and large uncertainties on the extracted Re(H_A) and Im(H_A). The comparison with similar information obtained on a proton, although not so straightforward, might give important information on nuclear structure. In addition, the ^{4}He gluon GPD can be accessed in DVMP. This portion of the run group requires 10 additional days of high intensity running on ^{4}He.

Proposal PR12-16-011B aims at a clean extraction of the neutron DVCS beam spin asymmetry in a bound and a quasi-free configuration to provide an unambiguous answer to the question whether nucleons are modified in medium at the parton level. To do so, measurements at ^{4}He and deuterium are proposed investigating ^{4}He+γ^* −> γ+p+^{3}H, ^{4}He+γ^* −> γ+(n)+^{3}He, ^{2}H+γ^* −> γ+(n)+p. For all these reactions the ALERT detector allows for spectator recoil tagging. The electron, photon and for the first reaction also the proton will in addition be measured in CLAS. In all cases the detection of the spectator nucleus/proton provides valuable additional information.

Proposal 12-16-011C highlights several other interesting physics topics which are complementary to the other run group proposals. Exclusive π^0 production, coherent exclusive DVCS from the deuteron and DVCS in three-body break up reactions are highlighted in the proposal. No additional run time is requested for these studies.

Issues: The Drift Chamber/scintillator technology needs to be demonstrated. We observe that a strong program of prototype studies is already underway.

The TAC report voiced concerns about the length of the straw cell target and the substantial effort needed to integrate the DAQ for this detector into the CLAS12 DAQ.
The proposal does not clearly identify the resources (beyond generic JLAB/CLAS12 effort) necessary for DAQ integration which may be a substantial project.

During review the collaboration discovered an error in converting the luminosity to beam current. This resulted in a revision that will either require doubling the current or the target density. The beam current change would require changes to the Hall B beam dump, while raising the target density could impact the physics reach of the experiment by raising the minimum momentum threshold.

The precise interplay between final state interactions (FSI) and the tails of the initial state momentum distribution in DVCS on ^{4}He was a topic of some debate. The collaboration makes an argument that the excellent acceptance of the apparatus allows novel constraints that allow selection of kinematic ranges where FSI is suppressed. While the originally suggested method to unambiguously identify areas of FSI was revised during the review, the committee remains unconvinced that the new kinematic selections suggested do not also cut into interesting regimes for the initial state kinematics. The committee believes that this is model dependent and would like to see more quantitative arguments than were provided in this version of the proposal.

Summary:
The committee was generally enthusiastic about the diverse science program presented in this proposal; in particular the tagged EMC studies and the unique study of coherent GPD's on the ^{4}He nucleus. However, the substantial modifications made in the proposal during review indicate that it could be substantially improved on a reasonably short time scale. We would welcome a new proposal that addresses the issues identified by the committee and by the collaboration.

We also note that there are multiple experiments, proposed and approved, to study the EMC effect, including several with novel methods of studying the recoil system.
We appreciate the comparisons of recoil technologies in this proposal and would welcome a broader physics discussion of how the proposed measurements contribute to a labwide strategy for exploring the EMC effect.

C12-15-001

Scientific Rating: A^-

Recommendation: Approved for 6.5 days, plus one day for calibrations

Title: "Measurement of the Generalized Polarizabilities of the Proton in Virtual Compton Scattering"

Spokespersons: A. Camsonne, M. Jones, M. Paolone, N. Sparveris (Contact person)

Motivation: The polarizabilities of the nucleon measure its response to external electric and magnetic fields. They express how easily the nucleon's charge or magnetic moment distributions can be deformed. As such they are fundamental properties of the nucleon. The proven method to access the polarizabilities is Compton scattering γ+N->γ+N. If the initial photon is virtual, one obtains the unique opportunity to probe the spatial distributions of the polarizabilities by a Fourier transform in momentum transfer. Generalized polarizabilities have been measured at JLab at $Q^2 \sim 1$ $(GeV/c)^2$ and, at lower Q^2, at MAMI (Mainz) and MIT-Bates. The published results for the electric generalized polarizability can be well described by a dipole fall-off, except for the MAMI data at $Q^2 = 0.33$ $(GeV/c)^2$ which are strikingly higher than that dipole fit.

This proposal was presented last year to PAC43. At that time, it was understood that new MAMI results at $Q^2 =$ 0.1, 0.2 and 0.45 $(GeV/c)^2$ would be forthcoming. This prompted the PAC to approve the proposal only conditionally, since it felt that it would be important to see the new MAMI data before a final decision could be made. In the meantime the new data have indeed been presented; they are still preliminary. They are much more consistent with the dipole fit than the MAMI point at $Q^2 = 0.33$ $(GeV/c)^2$, although they still have relatively large systematic uncertainties. In the light of the new results, additional experimental information would be very welcome. It appears important to revisit independently the polarizabilities at $Q^2 = 0.33$ $(GeV/c)^2$, and generally to perform measurements in that regime with much smaller statistical and systematic uncertainties.

Measurement and Feasibility: This experiment is planned for Hall C. Scattered electrons are to be detected with the Super High Momentum Spectrometer (SHMS) and protons with the HMS. The request is for 17 days of running with an unpolarized 4.4 GeV beam on a 15 cm liquid hydrogen target. The generalized polarizabilities are proposed to be measured at Q^2= 0.33, 0.43 and 0.52 $(GeV/c)^2$ [within 6.5 days] and at Q^2=0.65 and 0.75 $(GeV/c)^2$ [within 10.5 days]. In last year's report, the PAC urged the collaboration to include a measurement at Q^2= 0.33 $(GeV/c)^2$, corresponding to the value for the MAMI data mentioned above. We are glad to see that this point is indeed now part of the planned measurements.

Issues: Given the prior experience at JLab with measurements of generalized polarizabilities, there are no specific concerns regarding the feasibility of the measurement. Still, the expected systematic uncertainties have to be proven. We note that the Dispersion Relation approach, which helps to translate the cross section data to the actual polarizabilities, is theoretically well developed in the kinematic regime relevant for this experiment.

Summary:
In the light of the new situation resulting from the recent preliminary MAMI data, the PAC considers the physics case for this experiment to be particularly strong for the measurements proposed at the three lower Q^2-values, Q^2= 0.33, 0.43 and 0.52 $(GeV/c)^2$. We thus approve the 6.5 days of data taking requested for the measurements at these Q^2. Concerning the remaining 10.5 days of proposed running for obtaining the results at the two higher Q^2, the PAC encourages the collaboration to make a new request when the results from the now approved data taking will be available, demonstrating that systematics are under control.

C12-15-004

Scientific Rating: N/A

Recommendation: Deferred

Title: "Proposal of extension of the CLAS12 run-group C (ND_3 target)"

Spokespersons: S. Niccolai

Motivation: The proposal aims at forming a new run group which gathers the experiments of the run group Cb of CLAS and the C12-15-004 experiment. The former have already been approved by previous PACs (with 50 running days + 10 day of overhead) and the latter has been conditionally approved by PAC 43. These experiments share a longitudinally polarized beam and a longitudinally polarized deuteron target and are devoted to the exploration of the neutron structure, measuring GPDs (via DVCS experiments, C12-15-004), helicity distributions (via DIS experiments, E12-06-109) and TMDs (via SIDIS experiments with the production of both pions and Kaons, E12-07-107, E12-09-009, E12-09-007).

These experiments are part of the main focus of the experimental program of CLAS12, and their unique contribution is the investigation of the neutron structure; their data, combined with proton results from other approved experiments will allow a flavor separation of PDFs, GPDs and TMDs.

The contribution of C12-15-004 to the run group will provide the first ever neutron DVCS measurements of spin observables, target- and double-spin asymmetries, with a longitudinally polarized target in a wide 4-dim (Q^2, x_B, -t, φ) range. The data are expected to be mostly sensitive to the neutron Compton Form Factors Re(H_n) and Im(H_n), which will be extracted from a combined analysis including also neutron data on beam spin asymmetries from E12-11-003 (which has an unpolarized target). It should be noted that the neutron GPDs remain so far a mostly virgin field.

Measurement and Feasibility: This proposal requests the extension of the 50 + 10 days already allocated to run group Cb, to a total of 110 days, plus 23 days of overhead The extension of the running time would allow in particular a precise determination of the DVCS spin observables for the neutron, and a better determination of the neutron helicity distributions and TMDs.

For 10 days, out of 110, the Forward Tagger would be installed in order to maximize the acceptance for forward-emitted photons. The 10 days run with the Forward Tagger would be at half luminosity.

The proposed extension of the running time with a deuterium target would bring the total time dedicated to the study of the neutron structure closer to that dedicated to the proton structure.

Issues: The PAC considers the proposed measurements highly relevant and important. However, the PAC does not consider the extension of the running period on a deuteron target a crucial step in the general CLAS12 program of studying the 3-dimensional structure of nucleons, which has already several important experiments approved.

It has to be noted that experiment C12-15-004 has also presented a proposal of addition to the existing run group Cb (E12-06-109A), sharing their 50 + 10 days of running, which will allow to complete most of their valuable physics program.

Summary:
The PAC thinks that the addition of DVCS measurements (proposal E12-06-109A) to the run group Cb, will allow, within the 50 + 10 running days allocated, a valuable study of the polarized neutron structure. Their data can be combined with unpolarized neutron data, and with polarized and unpolarized proton data from other approved experiments, to provide an accurate study of the nucleon structure.

C12-15-005

Scientific Rating: A^-

Recommendation: C1

Title: "Measurements of Quasi-Elastic and Elastic Deuteron Tensor Asymmetries"

Spokespersons: Donal Day, Douglas Higinbotham, Dustin Keller, E. Long (contact), Karl Slifer, and Patricia Solvignon

Motivation: The motivation of the proposed experiment is to thoroughly test many important aspects of deuteron models, including the strength of the short-range repulsion and tensor force in the nucleon-nucleon interaction, the effect of relativity, and off-shell effects, by measuring tensor asymmetries from quasi-elastic and elastic deuteron scattering. Many of these effects are very important for short range correlations in heavier nuclei. Measurements of these tensor asymmetries will directly access the aspects of nuclear theory that are poorly constrained by unpolarized deuteron measurements (E12-10-003) and should greatly improve our knowledge of this most fundamental nucleus. This proposal has remarkably strong theory justification and support. Progress has been made on the target polarization.

Measurement and Feasibility: The proposed measurements will be carried out in Hall C using a tensor polarized deuteron target, the HMS, and the SHMS spectrometers. The proposed kinematic settings were chosen to cover both the quasi-elastic and elastic kinematics. The proposed measurements appear feasible. The only major technical issues are whether a tensor polarization of 30% or more will be achieved, whether it will be stable, and whether it can be measured precisely.

Issues: It is important to achieve the tensor polarization of 30% assumed in the proposal. While methods such as RF- "hole burning" are known to increase the tensor polarization above the thermal equilibrium value, these techniques including the polarization measurement have to be developed further to allow for a reliable operation under experimental conditions.

Summary:
The experiment is conditionally approved with the condition that a tensor polarization of close to 30% be achieved and reliably demonstrated under experimental conditions.

C12-15-008

Scientific Rating: A

Recommendation: Approved

Title: "An isospin dependence study of the ΛN interaction through the high precision spectroscopy of Λ-hypernuclei with electron beam (update of the conditionally approved C12-15-008)"

Spokespersons: Garibaldi, Markowitz, Nakamura (Contact person), Reinhold, Tang and Urciuoli

Motivation: The collaboration seeks to explore the isospin dependence of the three-body ΛNN interaction in ^{40}Ca (^{40}K$_\Lambda$) and ^{48}Ca (^{48}K$_\Lambda$). The team will measure the binding energy of both hypernuclei. This investigation should give insight into a specific coefficient, C_T of the ΛNN interaction, and the measurement should be able to reach a 2% accuracy in this quantity if the binding energies can be measured with a 100 keV accuracy. This coefficient is not well constrained in (Λ,N,Z-1) nuclei, but would be clearly constrained in the 40,48Ca hypernuclei according to recent AFDMC calculations.

The connection of this experiment with neutron stars comes through the nuclear equation of state. The two-nucleon and three-nucleon forces do allow for a star of two solar masses, but the densities in a neutron star are such that hyperons will be present. Inclusion of the ΛN interaction stiffens the equation of state, but not by enough to enable a two solar mass star. Inclusion of the ΛNN three-body interaction should enable the nuclear EOS to sustain a two solar mass star.

Once C_T is known from the experiment, the ΛNN interaction can then be used in a calculation of the Mass vs Radius for a neutron star that includes hypernucleons. Effort during the last two years – some from the time of conditional approval – includes a detailed theoretical study by the AFDMC group to demonstrate the effects of the C_T on the binding energies and on the neutron star mass-radius relations.

Measurement and Feasibility: The team will use (e,e'K$^+$) reactions to populate nuclei with a hyperon. This requires the high resolution HRS and the HKS spectrometer. The experiment will be carried out in Hall A. A significant set up time of greater than 6 months is required before the experiment becomes a reality. The beam energy needs to be precisely at 4.5238 GeV. The proposal requests 147 hours for hypernucleus calibrations and 508 hours for the measurement of the binding energies of the ^{40,48}Ca hypernuclei.

Issues: The Λ collaboration demonstrated in this proposal that it is ready to proceed to a valuable measurement that will constrain an important parameter in the ΛNN interaction. That constraint can then be used in calculations of the neutron star mass vs radius calculations. Issues are related more to obtaining funding for the needed magnetic systems, possibly to be paid for through Japanese funds.

Summary:
The PAC is pleased with the progress made by the spokespersons and recommends running the requested beam hours.

Run Group Additions

E12-06-108B

Title: "Transition Form Factor of the η′ Meson with CLAS12"

Spokesperson: Michael C. Kunkel

Motivation: Pseudoscalar exchange graphs are expected to largely dominate the hadronic light-by-light (HLBL) contribution to the muon anomalous magnetic moment a_μ. It is important that the corresponding uncertainty will significantly decrease in the coming years, so as to match the projected uncertainty in the upcoming a_μ experiments at Fermilab and JPARC. This CLAS12 experiment aims to constrain the timelike η′ transition form factor which is an input into current QED calculations of the pseudoscalar HLBL contributions.

Measurement and Feasibility: Dalitz decays of η′ mesons, $\eta' \rightarrow \gamma\ e^+\ e^-$, in which one photon is off-shell (decays where both photons are on-shell are considered background to this measurement), and where the η′ is produced in $e\ p \rightarrow e\ p\ \eta'$, are used to constrain the η′ transition form factor. The high luminosity, the lepton trigger capability, and the large angle acceptance at CLAS12 allow for a large reconstructed sample size. The external photon pair production background can be suppressed by exploiting the 1 mm vertex resolution, and there is a dilepton-dipion rejection factor of 10^{10} eliminating it.

Issues: Apparently, the form factor slope (or the dipole parameter) can be determined much better than needed for a_μ. On the other hand, corrections to these one-parametric forms may impact the η′ contribution to the HLBL effect, resulting in larger variations than the 0.5% statistical uncertainties quoted. Furthermore, the doubly-virtual transition form factor also enters the calculation of the HLBL contribution but is not constrained by this experiment. Similar remarks also apply to the lighter pseudoscalar contributions, so that the uncertainties associated with these issues may be correlated across these contributions.

In any case, this experiment would help to constrain and distinguish between theoretical approaches, such as Chiral Perturbation Theory, dispersive approaches, or vector meson dominance. This serves as an additional motivation for this measurement and could possibly mitigate the aforementioned issues. We note, that it is generally quite difficult to quantify the impact of experimental information entering HLBL calculations. The η′ transition form factor is no exception, but the analysis is nevertheless well worth the effort.

The systematic error (or at least a component of it) is deduced by propagation of a constant (in the invariant dilepton mass) efficiency error of 5% resulting in a (very small) 0.05% error in the slope parameter. However, any dilepton mass dependent components of the efficiency and its uncertainty might have a larger impact once propagated to the transition form factor. Care should be taken with effects like these to avoid an underestimate of the systematic error component.

Recommendation:
The PAC endorses the measurement of the timelike transition form factor of the η′ to the indicated precision.

E12-06-109A

Title: "Deeply virtual Compton Scattering on the neutron with a longitudinally polarized deuteron target"

Spokespeople: S. Niccolai

Motivation: The contribution of E12-06-109A to the run group will provide the first ever neutron DVCS measurements of spin observables, target- and double-spin asymmetries, with a longitudinally polarized target in a wide 4-dim (Q^2, x_B, -t, φ) range. The data are expected to be mostly sensitive to the neutron Compton Form Factors Re(H_n) and Im(H_n), which will be extracted from a combined analysis including also neutron data on beam spin asymmetries from E12-11-003 (which has an unpolarized target). It should be noted that the neutron GPDs remain so far a mostly virgin field. The PAC considers this proposal as a very valuable addition to the activity of run group E12-06-109.

Issues: None

Recommendation:
The PAC endorses the addition of this effort to the existing run group, and looks forward to the eventual results.

Letters of Intent

LOI12-16-001

Title: "An Experimental Test of Lepton Universality through Bethe-Heitler production of Lepton Pairs in Hall D at Jefferson Lab"

Spokesperson: Mark Dalton

Motivation: This is a very well-motivated measurement as it addresses the proton radius puzzle by cross-examining the muonic Lamb shift result by a muon scattering experiment at very low momentum transfer. More generally, lepton universality tests are motivated by apparent deviations from lepton universality in B decays at Belle, BaBar, and LHCb.

Measurement and Feasibility: The Hall D tagged photon beam is used for Bethe-Heitler lepton pair production in a new active hydrogen target of both electrons and muons. Recoil protons are detected (through their energy loss) and their momenta are determined by drift length and curvature. Electrons are detected in the forward calorimeter and muons by a new muon detector which is in progress for the approved E12–13–008 experiment. In the baseline solenoid design, the target will be placed in the GlueX target. A dipole setup would give better acceptance and resolution but would need significant new equipment.

While there is debate on exactly how to extract the charge radius from this type of measurement, this is much less of a problem in the comparison of the radii extracted from electrons and muons, where also many systematic uncertainties cancel. Thus, this is more rigorously a test of proton radius universality than it is a measurement of the radius.

Issues: The dominant background would be from pions originating from ρ^0 decays and decaying to muons. This can be mostly reduced with an invariant mass cut. Further reduction of this background as well as from Primakov pion pairs can be achieved by exploiting photon beam polarization, but a full proposal would need to be much more quantitative. Corrections for timelike Compton scattering and two-photon contributions will need to be calculated in detail.

Beam intensity and conditions are close to the approved experiment E12–12–002 in the high-luminosity GlueX-phase. Building the active hydrogen target (a time projection chamber) will be challenging.

There are a number of other experiments also addressing the proton radius puzzle, such as PRad in Hall B in electron scattering, as well as new hydrogen Lamb shift measurements. The most direct competition would be MUSE at the PSI utilizing both electron and muon scattering within the same experiment, but the present proposal reaches down to lower values of the momentum transfer squared by at least a factor of three, resulting in a shorter extrapolation.

Recommendation:
The PAC encourages the submission of a full proposal.

LOI12-16-002

Title: "Probing short-range nuclear structure and dynamics with real photons and nuclear targets at GlueX"

Spokespersons: Or Hen

Motivation: The collaboration will measure A(γ,X) and A(γ,XN$_{recoil}$) reactions for A=^{2}H, ^{4}He, ^{12}C, ^{28}Si, ^{40,48}Ca, and heavier nuclei. The collaboration proposes to investigate a broad number of properties utilizing the photonuclear reactions. The basic idea is that the coefficients in the expansion in Fock states of the proton in terms of quark and gluon degrees of freedom are modified in the nuclear system. These modifications should be detected through branching ratios to various particles in the photonuclear reaction. The physics program described in the LOI covers a broad spectrum of physics: modifications of nucleon structure in nuclei; contributions of protons and neutrons to the high-momentum tails of asymmetric nuclei; the Migdal jump; quasi-elastic scattering from a single nucleon in an SRC pair; discovering the transition from hadron to parton dominance.

Measurement and Feasibility: The LOI estimated that the proposed measurements will require a total 74 days at 12 GeV: 30 days with a deuteron target, 14 days with ^{4}He, and 30 days with the other nuclear targets. Pending scheduling constraints, the LOI states that the collaboration could benefit from an additional 30 days at 6 GeV divided in a similar way between the different targets. The LOI ties to the GlueX capability at the Laboratory. The LOI demonstrates some efforts underway in characterizing and simulating expected detector response for the measurements.

Issues: While the LOI lays out a large area of physics, it needs to focus on one piece of physics with theoretical justification for its importance. The collaboration needs to focus on a unique area that is not already being covered by another approved effort.

Recommendation:
A future proposal must contain convincing kinematics and an analysis of the expected systematic and statistical errors. The GlueX collaboration needs to become involved in vetting any future proposal as well.

LOI12-16-003

Title: **"Measurement of 3He Diffractive Minima with Polarization Observables"**

Spokespersons: R.E. McClellan, D.W. Higinbotham

Motivation: Measurements of the electric and magnetic form factors for ^{3}He have been carried out in the past using the Rosenbluth separation technique. The results have been confronted with theoretical model predictions using chiral effective field theory. As is well known from experience with the nucleon, form factor results for the Rosenbluth method differ at large Q^2 from those obtained using a polarization technique. This may be attributed to the presence of significant two-photon exchange contributions affecting the Rosenbluth separation. The present letter of intent proposes to measure the 3He form factors in a double-polarization experiment, in order to obtain an independent result. From this the proponents expect more meaningful comparisons with theory.

Measurement and Feasibility: Measurements of form factors using polarized scattering are by now relatively standard. The letter of intent plans to perform measurements over one week of beam time, running at 4.4, 6.6, and 8.8 GeV beam energy. The apparatus is nearly identical to that in the already approved E12-06-110 experiment that measures the deep-inelastic asymmetry A_1^n. As such we expect the measurement to be well feasible.

Issues: Even if a precise measurement of the location of the first diffractive minimum of the form factors using the polarization technique can be obtained, it is not quite clear what would be learned from this. The region near the diffractive minimum which is of main interest in this experiment is notoriously hard to address theoretically. Already now the spread of theoretical results — even within the same theory framework — is far larger than the accuracy of the data, more than 20 years after these data have been published. Firm conclusions from the comparison of data and theory have not been possible. It is also known that the tensions between form factor results for the Rosenbluth separation and the polarization method show up primarily at Q^2 values much higher than those relevant for this letter of intent. In other words, one would not really expect to see any differences for the extracted form factors for the two methods here. At the least, theoretical guidance should be obtained first on this point.

Recommendation:
For the reasons given above, the PAC presently does not encourage submission of a full proposal.

LOI12-16-004

Title: Electroproduction of muon pairs with CLAS12: Double DVCS and J/ψ electroproduction.

Spokespeople: S.Stepanyan (contact)

Motivation: This measurement would access two processes, DDVCS and J/ψ electroproduction, which have the same final state e p→ e' p' $\mu^+\mu^-$, and which require high luminosity ($10^{37}cm^{-2}sec^{-1}$), hence a substantial modification of CLAS12. DDVCS allows one to decorrelate variables (x and ξ) while it is not possible in DVCS. J/ψ near threshold probes the gluonic structure of the nucleon, and also the electroproduction of the LHCb pentaquark in the J/ψ p channel.

Measurement: The experiment would measure exclusive electroproduction of muon pairs (not electrons) on a 20cm proton target, e p→ e' (p') $\mu^+\mu^-$, in the range 2< W < 4.5 GeV, Q^2 ~ 1- 5 GeV^2, for muon pair masses < 3.5 GeV. The goal is twofold: to measure DDVCS beam spin asymmetry (interference with BH), and to study J/ψ electro production (cross-section and σ_L/σ_T) close to threshold.

100 days of beam will be required as part of a new run group. The modification of the setup to accommodate luminosities of the order 10^{37} $cm^{-2}sec^{-1}$ would be achieved by replacing the HTCC detector with a set of GEM trackers followed the new compact PbWO4 calorimeter for the detection of the scattered electrons, and a tungsten shielding of CLAS12 detector against forward EM and hadronic backgrounds, while CLAS12 Forward Tracking system would detect muon pairs.

Issues: None

Recommendation:
The PAC recognizes the importance of the measurements of DDVCS for the determination of GPDs, but finds it premature to develop a full proposal. Results have yet to be realized at 12 GeV from the DVCS program. Furthermore, the SoLID collaboration has a similar Letter of Intent (submitted to PAC43) to study this physics, and complementarity between the two approaches will need to be demonstrated.

LOI12-16-005

Title: "Target Helicity Correlations in GlueX"

Spokespeople: D. Keller, F.J. Klein, W.K. Brooks, C. Keith

Motivation: This measurement would expand the GlueX program to include spin dependent observables for polarized photon beams between 5-9 GeV. This requires the construction of a new proton and deuteron polarized target, capable of both longitudinal and transverse spin orientation, designed for operation inside the standard GlueX detector package.

Measurement: The experiment would determine single spin (beam and target), double spin (beam-target, beam-recoil, target-recoil) and tensor polarized asymmetries in pseudoscalar and vector meson production, as well as in Real Compton Scattering channels. Spin dependent measurements will complement the existing GlueX program by allowing for the determination of complete isospin amplitudes and assisting in the search for exotic mesons.

Issues: The physics motivations are very general and undeveloped and the kinematic reach of the proposed asymmetries are often not specified. Clearly spin observables add information, but the most important channels may only become clear after the GlueX program has matured.

The PAC recommends working closely with theorists to make sure these channels can be interpreted within a theoretical framework. To give one specific example, using J/Psi production to extract information about gluon helicity is complicated in the threshold region.

A full proposal would require a final design and proof of concept for the longitudinal and/or transversely polarized target. Since shielding magnets are required for the transverse target a discussion of how this additional material affects reconstruction in the nominal GlueX detector, and therefore asymmetries in the proposed channel, should be addressed.

Recommendation:
The PAC recommends waiting a few years until the landscape is clearer and then focusing on a few well chosen channels to develop for the proposal.

LOI12-16-006

Title: "Search for Exotic Gluonic States in the Nucleus"

Spokespersons: J.Maxwell

Motivation: 25 years ago the existence of a double helicity flip structure function $\Delta(x,Q2)$ was predicted. The structure function is expected to be sensitive to the gluonic components in the target and vanishes for a bound state just of protons and neutrons. The interest of this LOI is to understand to what extent a nucleus is more than a collection of nucleons and whether there might be even some novel gluonic components in nuclei not found in individual nucleons.

Measurement and Feasibility: Δ can be accessed with an unpolarized electron beam and a transversely polarized nuclear target with spin ≥ 1. The experiment is planned for Hall C in the low x-regime (<0.3). To determine Δ three experimental options are mentioned, so far without feasibility studies performed:
(a) measuring a tensor asymmetry, (b) measuring polarized and unpolarized cross sections rather than an asymmetry to avoid to need for a highly tensor aligned target, (c) measuring the coefficient of the cos(2phi)-term in the cross section

Issues: A similar LOI was reviewed in PAC 42. Important progress has been made on the theory side, where a clear signal was found for the first moment of $\Delta(x,Q2)$ on a spin-1-phi meson on the lattice showing that such quantities are in principle calculable and that there is no unexpected suppression of the double-helicity-flip observed. This is without doubt an encouraging result. Still the question of how large Δ in the nucleus is and how sensitive an according measurement might be is a crucial open question. Detailed calculations of Δ, e.g. from lattice are needed. How well one will be able to measure this quantity still remains an open question.

The target is a further challenge: Even though successful experiments at JLab and SLAC have shown that the JLab/UVa solid targets provide a dependable solution, further R&D is needed to provide high values for the tensor polarization (of nitrogen) and to be able to measure the polarization during the experiment.

Of course many additional experimental issues need to be addressed and discussed in detail in a full proposal. One of those is how the systematics will be controlled (changes in the detector efficiencies over time, unmeasured drifts in luminosity). Another issue is the study of possible background sources to the asymmetry. In the new LOI, the option to suppress background from the tensor structure functions b1 and b2 at the expense of a new target magnet (target helicity angle at 54.7°) is mentioned.

Recommendation:
This LOI presents an interesting idea. For a full proposal the issues above need to be addressed in detail. To do so requires not only significant work on the experimental but also on the theory side. The PAC encourages the collaboration to prepare a full proposal.

LOI12-16-007

Title: First Measurement of the e − ^{3}He Parity Violating Deep Inelastic Scattering Asymmetry Using an Upgraded Polarized 3He Target

Spokespeople: Xiaochao Zheng (**contact**), Yuxiang Zhao, Gordon Cates

Motivation: This letter of intent proposes to perform parity-violating asymmetry measurements on a longitudinally polarized ^{3}He target in the DIS region using an unpolarized electron beam. (Thus is in contrast to earlier programs that use a polarized beam on an unpolarized target.) The three physics goals are: a) perform first measurement of the polarized electroweak interference structure functions $g^{\gamma Z}_1$ (prop to $\Delta\Sigma$), and $g^{\gamma Z}_5$ (sensitive to valence quark polarization), b) provide direct, model-independent information on $\Delta\Sigma$, and c) test SU(3) flavor symmetry for the first time by combining the extracted $g^{\gamma Z}_1$ with data on g^p_1 and g^n_1 from spin structure experiments. In other words, by combining $g^{\gamma Z}_1$ with g^p_1 and g^n_1 they will obtain a value for $\Delta\Sigma$ without the assumption of SU(3) symmetry. Those measurements may also serve as exploratory measurements for the future EIC.

Measurement and Feasibility: The experiment can be performed with the planned SoLID spectrometer in Hall A using a 60 μA, 11 GeV beam on a new, high-density polarized ^{3}He target. The polarized ^{3}He target would be a further upgrade of a planned upgrade of a polarized ^{3}He target for the 12 GeV Gen experiment, by pushing the density by an extra factor of 16 (4x from pressure and 4x from running at 77 K). This increase in density appears very challenging. The request is for 180 PAC days of running.

Issues:

- The new polarized ^{3}He target appears very challenging, and will need a lot of R&D work. The pressure of 40 atm seems high. Metal windows are needed to withstand the 60 μA currents requested. The question then arises whether the metal-glass junction can hold the 40 atm pressure? Circulation of a polarized ^{3}He between the pumping and target cell based on convection maybe challenging. This would be a stage 3 upgrade from the current polarized ^{3}He target technology at JLab.
- As pointed out by the Theory TAC, the value of such an experiment depends on the precision and the extent to which for example two-boson contributions are correctly accounted for. Trigger rates are high, but possibly within the expected specs for the SoLID DAQ.
- The 180 days requested do not include contingency for target density reduction with beam on. This maybe a real issue and significantly extend the beam time needed to realize the physics goals.

Recommendation:
The committee acknowledges the physics case. There are many technical challenges, however, that need to be addressed before such an experiment could be realized. Before proceeding to proposal stage, the committee recommends that it is demonstrated that the required polarized ^{3}He target parameters have been met, and that a demonstration of systematic errors over time period of minutes at the part per million levels have been realized.

LOI12-16-008

Title: "Test of Time Reversal Invariance Using Electron Scattering on Polarized Protons"

Spokespersons: D. Keller (UVA)

Motivation: This is a letter of intent to pursue a test of time reversal invariance by a measurement of the inclusive asymmetry in the scattering of electrons on polarized protons in the region of the nucleon resonances at JLab using the UVA NH_3-target and the SoLID detector. The measurements would be based on the observation of a correlation **s.(k** x **k')** with **s** being the polarization of protons in a solid polarized NH_3 target polarized perpendicular to the beam axis. **k** and **k'** are the momenta of the incoming electron and the scattered electron detected in a large acceptance spectrometer. The method was proposed by Cahn and Tsai in the 70s. Similar experiments carried out 30 years ago at SLAC achieved upper limits at the 1-2% level. The proponents aim to improve these limits by a factor of 100 to 250.

Measurement and Feasibility: The measurement consists of a measurement of the transverse target spin asymmetry in the resonance region with an unpolarized beam of electrons and an unpolarized beam of positrons in order to suppress order alpha^3 processes like two-photon exchange amplitudes. A fast flip of the target polarization would allow cancellation of the effects of slow detector variations. In the absence of a fast spinflip, the aimed improvement of the present limits requires an understanding of the stability of detector efficiencies on the level of 10^{-4}.

Issues: No details on the physics impact nor on the expected level of t-violation in the framework of the standard model of such a test at a level of 10^{-4} is given. The proposed UVA-NH_3-target reaches 60% of the polarization after 4ms and needs further 10-20 min to reach the maximum polarization. This cannot be regarded a fast spin flip, meaning that the time reversal asymmetry must be obtained from a direct comparison of two absolute measurements rather than from a relative measurement. Multi-photon processes that can mimic time reversal non-invariance must be separately measured by performing the same experiments with a positron beam, which is impractical at present. Other issues involve small, remaining longitudinal target polarization components, influence of different beam properties for electron and positron beam etc.

Recommendation:
The LOI in its present form cannot be evaluated. The PAC could not recognize any description of a measurement method addressing the challenge of measuring a transverse target spin asymmetry with an absolute uncertainty of 10^{-4} employing an electron and a positron beam. While the present LOI is an exact copy of a deferred LOI-01-002 complemented by an addendum describing recent target and detector developments, the authors did not comment on the issues raised by PAC 19. The PAC does not appreciate the submission of LOI with such a low level of information.

LOI12-16-009

Title: "Timelike Compton Scattering on a Transversely Polarized Proton Target in SoLID"

Spokespeople: D. Keller (Contact)

Motivation: This letter of intent expresses interest in measuring Timelike Compton Scattering (TCS) with a transversely polarized target. The interest for TCS measurements as complementary to DVCS measurements for the extraction of GPDs has already been stated and measurements of TCS with an unpolarized proton target are already foreseen. The measurements with transversely polarized proton targets and a longitudinally polarized electron beam can be used to study the imaginary and real part of H˜ and E and would have a relevant impact in the GPD extraction program.

Measurement: The proposal is to collect the data for TCS at the same time as data taken for the Single target Spin Asymmetries in SIDIS off the transversely polarized NH3 target in experiment E12-11-108, taking advantage of the large angle coverage and high acceptance of SoLID. These measurements could be complementary to those proposed in the dedicated experiment of LOI12-15-007.

Issues: No detail on the measurements nor hints on its feasibility are given in the LOI. In particular, there is no information in the LOI on the measured quantities, the covered kinematic ranges and the expected statistical and systematic uncertainties in the parallel running with E12-11-108.

Recommendation:
The PAC does not appreciate the submission of a Letter of Intent with such a low level of information. Also, in this particular case (no additional beam request) the measurement should be discussed directly inside the E12-11-108 Collaboration as part of a Run Group.

Program Status

12 GeV Approved Experiments by Physics Topics

Topic	Hall A	Hall B	Hall C	Hall D	Other	Total
The Hadron spectra as probes of QCD (GluEx and heavy baryon and meson spectroscopy)		2	1	3		**6**
The transverse structure of the hadrons (Elastic and transition Form Factors)	5	3	3	1		**12**
The longitudinal structure of the hadrons (Unpolarized and polarized parton distribution functions)	2	3	6			**11**
The 3D structure of the hadrons (Generalized Parton Distributions and Transverse Momentum Distributions)	5	9	7			**21**
Hadrons and cold nuclear matter (Medium modification of the nucleons, quark hadronization, N-N correlations, hypernuclear spectroscopy, few-body experiments)	7	3	7		1	**18**
Low-energy tests of the Standard Model and Fundamental Symmetries	3	1		1	1	**6**
TOTAL	**22**	**21**	**24**	**5**	**2**	**74**

12 GeV Approved Experiments by PAC Days

Topic	Hall A	Hall B	Hall C	Hall D	Other	Total
The Hadron spectra as probes of QCD		219	11	540		**770**
The transverse structure of the hadrons	145.5	185	110	25		**465.5**
The longitudinal structure of the hadrons	65	230	165			**460**
The 3D structure of the hadrons	409	972	212			**1593**
Hadrons and cold nuclear matter	208	175	201		14	**598**
Low-energy tests of the Standard Model and Fundamental Symmetries	547	180		79	60	**866**
Total Days	**1374.5**	**1961**	**699**	**644**	**74**	**4752.5**
Total Days – Without MIE Days	**725.5**	**1961**	**699**	**644**	**28**	**4057.5**
Total Approved Run Group Days (includes MIE)	**1374.5**	**926**	**656**	**424**	**74**	**3454.5**
Total Approved Run Group Days (without MIE)	**556.5**	**926**	**656**	**424**	**28**	**2590.5**
Total Days Completed	**20**	**30**	**0**	**25**	**0**	**75**
Total Days Remaining	**536.5**	**896**	**656**	**399**	**28**	**2515.5**

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Charge to PAC44

Review new proposals, previously conditionally approved proposals, and letters of intent for experiments that will utilize the 12 GeV upgrade of CEBAF and provide advice on their scientific merit, technical feasibility and resource requirements.

Identify proposals with high-quality physics that, represent high quality physics within the range of scientific importance represented by the previously approved 12 GeV proposals and recommend for approval.

Also provide a recommendation on scientific rating and beam time allocation for proposals newly recommended for approval.

Identify other proposals with physics that have the potential for falling into this category pending clarification of scientific and/or technical issues and recommend for conditional approval. Provide comments on technical and scientific issues that should be addressed by the proponents prior to review at a future PAC

For newly approved Stage II PAC44 proposals, PAC should consider if any of these should be included in the "High Impact" category to receive priority for scheduling in the early (first 3-5 years) running.