Jefferson Lab
Thomas Jefferson National Accelerator Facility

REPORT OF THE 39TH PROGRAM ADVISORY COMMITTEE (PAC39) MEETING

June 18 – 22nd, 2012

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

October 18, 2012
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Dear Jefferson Lab Users,

One of the great pleasures that I have as Director is seeing the new and exciting experimental proposals that come from our user community. The quality of these proposals is an indicator of the forefront scientific program that Jefferson Lab enables for its users, and this PAC was no exception.

The Program Advisory Committee (PAC39) reviewed 13 new proposals, 6 conditionally approved proposals, and 3 letters of intent. There were 5 C1 approvals which have been approved by the PAC but require further review by the lab management regarding technical requirements, and 3 C2 approvals which must return to the PAC within the next 3 PAC meetings to address concerns or issues to obtain approval.

The Chair of the PAC39 was again Naomi Makins, whose intense concentration on the issues brings to a forefront the important issues. We are incredibly impressed by the continued efforts of our diverse committee.

Sincerely,

Hugh Montgomery
Laboratory Director

Remarks from the Chair on behalf of the Committee

The committee's discussions at PAC39 included an administrative topic: the need for a change to the PAC's modus operandi for the 12 GeV era. This issue was addressed by Deputy Director, Bob McKeown, in the PAC39 charge, as described below. It also arose naturally during our deliberations, as it has with increasing frequency in recent years.

In brief, the definition of "**Approval**" for a 12 GeV experiment as "suitable for the **top half of the priority list for the first five years**" has provided an excellent throttle on the committee's enthusiasm since PAC30, but it has now run its course. Thanks to this restrictive definition, the approved 12 GeV experiments amount to 6-7 years of running at 35 weeks/year — a number that would have been far larger without the "top-1/2-first-5" rider. PACs 30, 32, and 34 framed the schedule with the experiments that had been long anticipated for 12 GeV, as well as several ingenious newcomers. PACs 35–38 completed a second pass through the approved list, assigning scientific grades topic-by-topic while approving further new proposals. The backlog is now clearly established, and PAC39 is the first committee to fully confront it.

The committee would like to make two remarks about this situation: it is clear to us that **a new procedure for approving 12 GeV experiments is needed** and that, as a result of the previously established criterion and subsequent backlog, **we are now applying the Approval rating in an inconsistent fashion**.

The essential point is that *new experiments are now being compared to the large backlog of approved ones*. This makes the "top-1/2-first-5" approval condition harder to meet for new experiments than before. The proposals that were most strongly affected by the committee's evolving mindset were those in the more established subject areas. In some of these areas, the list of approved experiments already includes excellent programs that are fully sufficient for the top-1/2-first-5 period. These subjects are essentially *full* under the present charge. With no mechanism to "un-approve" existing experiments, we felt it impossible for the PAC to approve any more proposals in these areas that would further add to the backlog. The only proposals that we approved in such areas (if any) were those designed to run parasitically with already approved experiments. The intent of the original charge was to establish an early program that *sufficiently* covers each of the high-impact areas in JLab's physics program. Somewhere this list must be closed, and a new Approval condition must be given to the PAC. That point has clearly been reached.

A second illustration of the need for a new charge comes from proposals involving instrumentation beyond the baseline equipment. The MOLLER, SBS, and SOLID detectors are not part of the baseline equipment, but they were proposed early in the 12 GeV review process, were accompanied by compelling physics cases, and have been on the Approved list for quite some time. MOLLER, for example, was being discussed as a flagship experiment for the fundamental symmetries program before the first 12 GeV PAC. SOLID was a relative newcomer but appeared at PAC34 with two strong physics programs, covering both fundamental symmetries (PV-DIS) and nucleon structure (TMD measurements that, at the time, seemed inaccessible at CLAS due to the complications of a transversely-polarized target). These are all cornerstone physics topics that clearly met the "high priority" criterion for approval. Consequently, they were either approved directly (MOLLER) or went through some part of the Defer–C2–C1 sequence on technical grounds before being approved at a later meeting (SOLID). All three detectors had approved experiments associated with them by the time the grading pass began, and have been *effectively treated as part of the baseline equipment* ever since. For example, PAC39 approved SOLID's latest proposal even though it is essentially impossible that it can run in the first five years. It was approved because its physics case is at the same high level of the other approved SIDIS experiments at SOLID, so it would be inconsistent to do anything else. To summarize: we are aware that our treatment of some large-scale experiments using non-baseline equipment no longer follows the official PAC charge, as the "first 5 years" part of the approval constraint has effectively been abandoned due to precedent. This sort of issue arises inevitably during a protracted period of deliberations like the six years of 12 GeV PACs, and must now be addressed by a new charge.

It is important to stress that we have been consistent in our *scientific ratings* of approved experiments. These ratings are awarded on scientific grounds, and have nothing to do with the practical concerns of running an experiment in the first 5 years. What concerns us is the mechanism for *obtaining approval*, which clearly requires revision.

The Deputy Director presented us with two charges that directly address these issues. The first is:

> "The PAC will hear presentations from the Hall Leaders regarding the plans for commissioning the 12 GeV facilities and early physics running. We request that the PAC comment on these plans, considering

the likely status of the facilities during this early running period, but also the appropriateness of the choice of physics topics."

The committee was very impressed with the Hall Leaders' presentations. Each laid out a plan that included a well-considered mixture of physics impact and practical considerations. We found little to add: the PAC's scientific ratings were taken into account, and on the subject of scheduling, our committee does not have sufficient information to critique the Hall Leaders' choices. We did not have the time at this meeting to inspect the specific choices in great detail, but the commissioning schedule is so dominated by practical considerations that the PAC is unlikely to be of further use in its design.

The second charge is more closely related to the concerns we confronted all week:

> "Given the current (and growing) backlog of approved experiments, we anticipate that it will be necessary to readdress priorities for scheduling the program (beyond the early running period discussed in the previous charge) at the beginning of the 12 GeV running period. The PAC should consider different options for re-evaluating the priorities in order to establish the highest impact program possible with the 12 GeV facilities. We request that the PAC provide a recommendation on the procedure to be followed."

The first charge concerned the commissioning phase, namely the first 1.5 or so years of beam in each hall. The second charge addresses the 3-5 year period immediately following that, which can be termed "early production running". We were unable to arrive at a precise recommendation; instead, many ideas were raised. I will endeavour to summarize them below.

1. The "**top-1/2-first-5**" definition of an **approved** 12 GeV experiment must be changed before the next PAC. The examples presented above amply demonstrate that the restrictive 1st-phase approval criterion has now run its course.

2. The **backlog** must be addressed in some way. It amounts to 7 years of running under good funding conditions. This is quite far beyond the goal of the "top-1/2-first-5" round of approvals, which was to generate a pool of reasonable size from which to build an optimized program for the first three or so years of running. The 12 GeV PACs began with PAC30 in mid-2006. Six years is a very long time to continue to add to the pool without an opportunity to winnow its size (except indirectly, via the scientific-grade assignments.) Conversely, the field must be opened so that new proposals may again compete on an equal footing with those already approved. There is a spectrum of possibilities for how to proceed, bounded by two extreme choices. One extreme – "un-approving" the current backlog and re-competed everything from scratch – would be a time-consuming and unprecedented exercise that is clearly impractical and can safely be excluded. The other extreme is to leave the backlog and its scientific ratings alone, unrestrict the Approval condition, and allow new proposals to be reviewed as normal. An intermediate possibility is to review and revise the scientific ratings of the approved experiments at a later date, taking into account possible new developments in each field. One variable that is relevant to this discussion is how and when the laboratory plans to implement a "jeopardy clock": the traditional mechanism for re-competing approved experiments with new proposals. No conclusion was reached at this meeting as to how best to proceed.

3. The **"big experiments"** — those with large installations and long running times — merit some discussion. Our thoughts here are a bit vague, we just want to point out that they are the "elephants in the room" that hover over our mental shoulders during our discussions. When scheduled, experiments like MOLLER and SOLID will impose implacable boundary conditions on what can be done in the various halls. Their extensive physics programs will also change the landscape of what can be accomplished, and of how much need there is for smaller, dedicated experiments. These pillars of the future program are not part of the baseline equipment and not yet fully funded, but we have been treating them as such for some time (as described above). This change occurred in a gradual, organic way that was not clearly defined; it is thus unclear how we should treat any new proposals of similar magnitude. JLab physics is inevitably moving in the direction of large collaborations with long-running, multi-purpose detectors. These are powerful facilities with rich programs, but the laboratory can only accommodate so many. It would also be fruitful to consider what balance the laboratory would like to maintain between large experiments and smaller, dedicated runs … or if it is worthwhile to maintain such a balance at all. Finally, the committee discussed how the PAC should review multi-purpose experiments in the future: once they are operational, the collaborations can decide internally to pursue whatever physics analyses they like, so of how much benefit is it for the PAC to review each topic from a single run group as a separate proposal? We considered the model set by CLAS — to present such proposals individually — and discussed whether or not it should be continued in the future. The one conclusion we reached was that, whether

or not future PAC presentations are reorganized into more compact groups, it is important for the PAC to *be aware* of the various analyses planned by the experiments. Whether or not the collaborations choose to prioritize their efforts according to PAC recommendations, the smorgasbord of CLAS proposals over the years has provided crucial information for evaluating *other* experiments planning similar measurements, and for assessing the coherence and balance of the lab-wide effort in a given area.

4. **Practical concerns of already approved experiments**: The preceding remarks are focused on reopening the approval process with a less restrictive condition, now that the first round of approvals is completed. However, we would like to counterbalance this with two equally important remarks: first, that the first-round pool forms an excellent, well-balanced group of experiments that will explore new territory; and second, that many of these experiments are *already building*. First beam is not that far off. New proposals in areas that are already well covered should be mindful of these facts, and ensure that they are adding something qualitatively new that will have a clear impact on their field. Reducing error bars without profoundly changing the impact on theory is not enough to displace an approved experiment that is actively preparing to measure the same quantity.

The second charge requested advice on how to "readdress priorities for scheduling the [period of early production running] … in order to establish the highest impact program possible with the 12 GeV facilities". The PAC has only one mechanism for prioritizing approved experiments: the scientific rating. The question of whether or not to review the already assigned ratings was mentioned above (no conclusion was reached). We also discussed whether the committee could contribute any further to the development of a high impact program for early production running at 12 GeV. We came up with a handful of criteria beyond the scientific rating that might also be taken into account:

- High impact: Scheduling high-impact experiments early on is clearly a priority. Benefits include public visibility of the lab and the recruitment of new students to the field. It is possible that the often-used but rarely-scrutinized phrase "high impact" is not entirely synonymous with "high scientific rating"; some thought should go into what we mean by it based on what we are trying to achieve (publicity, recruitment, etc).

- Each hall needs a highlight: As the halls are reviewed separately by the DOE, each hall's commissioning plan should include a high-impact experiment that can generate a noteworthy publication on a reasonable timescale.

- Each community needs a highlight: One of Jefferson Lab's strengths is the breadth of its program, which spans the hadron structure, nuclear structure, and fundamental symmetries quadrants of nuclear physics. To preserve and strengthen JLab's visibility in these communities, it is desirable to select high-impact experiments for early running that are balanced across subfields.

- Some short experiments should run early: It will be of great benefit to the laboratory if the 12 GeV upgrade can be shown to be operational as soon as possible after first beam. It is thus important to schedule some experiments early on purely on the merits of fast turnaround (rather than scientific rating).

- Coordination within subfields: Some subfields of the JLab program are highly coordinated, with different experiments in different halls contributing pieces of a larger puzzle. The SIDIS and GPD programs are prime examples of this coordination. They are also good examples of "long haul" efforts: the new data will be of unprecedented statistical precision, but the statistics will go to waste if the data cannot be *interpreted* with commensurate accuracy. In contrast to the (poorly defined) "high impact" experiments alluded to above, some areas will require patience and a sober, phased approach to ensure that we know what we are doing before continuing to the next step. One example is the first measurement of $R = \sigma_L/\sigma_T$ in SIDIS. It is not a glamorous quantity, but it is needed for the interpretation of any SIDIS asymmetry. World data so far have made do with guesses (from $R_{SIDIS} = 0$ to $R_{SIDIS} = R_{DIS}$), but these will not be sufficient when the luminosity of JLab-12 is available. Another example is the GPD program, where it is pointless to display new asymmetries before scaling has been established in a given channel. Such physics considerations can affect the optimal ordering of some experiments.

- Young spokespeople: The health of our field is predicated on the health of our young scientists' careers. Though more difficult to take into account than the previous considerations, sociological concerns should not be neglected. New faculty members with approved experiments face a long wait before first beam. It would be wise to keep them in mind and minimize their further wait for a first result they can call their own.

The committee feels that it could contribute on some of these points, chiefly those concerning coordinated physics efforts, the evaluation of "high impact" experiments, and the perspectives of different communities. We did not reach a decision

on how best to provide input, how to accomplish a coherent fusion of these disparate criteria, or whether these concerns are important enough to disrupt the traditional "scientific-rating-only" role of the PAC. These questions can be addressed at the next PAC meeting, should the laboratory desire further input. We regret our inability to provide more concrete suggestions, but hope that some of these ideas will be helpful in determining the next task for the PAC.

We extend our sincere thanks to the laboratory management and hall leaders for their seamless organization and informative presentations; to the authors of the proposals for their ingenuity, vision, and hard work; and to Susan Brown for her world-unique ability to be tirelessly patient, impossibly efficient, and forever kind, all at the same time.

Naomi C.R. Makins, PAC Chair

Introduction

The Jefferson Lab Program Advisory Committee held its 39th meeting from June 18th through June 22nd, 2012. The membership of the committee is given in Appendix A. In response to the charge (Appendix B) from the JLab Director, Dr. Hugh Montgomery, the committee reviewed 19 potential experiments: 13 new proposals, 3 Letters of Intent and 6 conditionally approved.

In addition the PAC held discussions regarding reassessment of scientific priorities prior to the beginning of full 12 GeV production running.

Recommendations

PAC 39 SUMMARY OF RECOMMENDATIONS								
NUMBER	**CONTACT PERSON**	**TITLE**	**HALL**	**DAYS REQUESTED**	**DAYS AWARDED**	**SCIENTIFIC RATE**	**PAC DECISION**	**TOPIC***
PR12-12-001	Pawel Nadel-Turonski	Timelike Compton Scattering and J/psi photoproduction on the proton in e^+e^- pair production with CLAS12 at 11 GeV	B			A-	Approved	4
PR12-12-002	Curtis Meyer	A study of meson and baryon decays to strange final states with GlueX in Hall D	D				C2	1
PR12-12-003	Liping Gan	Symmetry Tests of Rare Eta Decays to All-Neutral Final States: The Jlab Eta Factory (JEF) Experiment	D				Defer	6
PR12-12-004	Seamus Riordan	C-REX: A Parity-Violating Measurement of the Weak Charge Distribution of 48Ca to 0.03 fm Accuracy	A				C2	5
PR12-12-005	Garth Huber	The Longitudinal Photon, Transverse Nucleon, Single-Spin Asymmetry in Exclusive Pion Electroproduction	C				Defer	4
PR12-12-006	Zein-Eddine Meziani	Near Threshold Electroproduction of J/Psi at 11 GeV	A			A-	Approved	5
PR12-12-007	Paul Stoler, Christian Weiss	Exclusive Phi Meson Electroproduction with CLAS12	B			B+	Approved	4
PR12-12-008	Lei Guo	Photoproduction of the Very Strangest Baryons on a Proton Target in CLAS12	B				C2	1
PR12-12-009	H. Avakian	Measurement of transversity with dihadron production in SIDIS with transversely polarized target	B			A	C1	4
PR12-12-010	L. Elouadrhiri	Deeply Virtual Compton Scattering at 11 GeV with transversely polarized target using the CLAS12 Detector	B			A	C1	4
PR12-12-011	Vincent Sulkosky	Measurements of A_par and A_perp to Extract GEn and GMn at Q^2 = 1--2.6 $(GeV/c)^2$ from the Inclusive polarized ^{3}He(e, e2) Reaction	C				Defer	2
PR12-12-012	John R.M. Annand	Measurement of the Ratio GEn/GMn by the Double-polarized 2H(e,e'n) Reaction	A/C				Defer	2

NUMBER	CONTACT PERSON	TITLE	HALL	DAYS REQUESTED	DAYS AWARDED	SCIENTIFIC RATE	PAC DECISION	TOPIC*
PR12-12-013	Claudio Ugalde	Measurement of 19F(g,a)15N with a bubble chamber and a bremsstrahlung beam	INJ				Defer	
C12-11-006	Stepan Stepanyan	Status of the Heavy Photon Search Experiment at Jefferson Laboratory	B			A	C1	**6**
C12-11-008	Peter Fisher	A Proposal for the DarkLight Experiment at the Jefferson Laboratory Free Electron Laser	FEL			A	C1	6
C12-11-102	Tanja Horn	Measurement of the Ratio R=L/T in Exclusive and Semi-Inclusive Neutral Pion Production	C				Defer	4
C12-11-106	Ashot Gasparian	High Precision Measurement of the Proton Charge Radius	B			A	Approved	2
PR12-11-108	Haiyan Gao	Target Single Spin Asymmetry in Semi-Inclusive Deep-Inelastic (e, e′$\pi^{\pm}$) Reaction on a Transversely Polarized Proton Target	A			A	Approved	4
C12-11-111	M. Contalbrigo	Transverse spin effects in SIDIS at 11 GeV with a transversely polarized target using the CLAS12 Detector	B			A	C1	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 2/PAC Review

Proposal Reports

Proposal: PR12-12-001 **Scientific Rating: A-**
Recommendation: Approved

Title: Timelike Compton Scattering and J/psi photoproduction on the proton in e^+e^- pair production with CLAS12 at 11 GeV

Spokespersons: M. Guidal, T. Horn, P. Nadel-Turonski, R. Paremuzyan, S. Stepanyan

Motivation:
The primary aim of this proposal is to measure the γ p -> e^+e^-p process (timelike Compton scattering) in the e^+e^- mass region between the ρ′ and the *J/ψ* mesons. This reaction is complementary to the deeply virtual Compton scattering (DVCS), providing a novel access to Generalized Parton Distributions (GPDs). Using unpolarized photons, the real part of the interference with the well known Bethe-Heitler mechanism accesses the subtraction constant in a dispersion formalism for DVCS. Such measurement is equivalent to a charge asymmetry measurement (using $e^+$and e^- beams) in DVCS. Using circularly polarized photons, one directly accesses the imaginary part of the Compton form factors, which are proportional to GPDs. A comparison of both DVCS and timelike Compton processes will allow for a strong test of the universality of GPDs (analogous to comparing the DIS and Drell-Yan processes).

The same experiment will also allow for an exploratory study of the threshold *J/ψ* photoproduction on a nucleon, which aims at accessing a gluonic form factor of the nucleon.

Measurement and Feasibility:
The experiment will use the upgraded CLAS12 detector, an 11 GeV highly polarized electron beam, and an unpolarized hydrogen LH_2 target. A pilot experiment at 6 GeV has shown the feasibility of this quasi-real photon experiment, and measured a large cos φ azimuthal angular asymmetry of around 30 %. In order to be above the resonance region in the e^+e^-system, the proposed experiment requires the higher beam energy of 11 GeV. Two main sources of systematic uncertainty in the γ p -> e^+e^- p process are the acceptance corrections as well as the lepton identification. For a detailed study of these corrections the PAC strongly endorses the proposal's request for a running with reversed torus field.

Issues:
There are no major issues

Recommendation: Approved
The PAC approves the experiment for 100 days of beamtime with normal torus field, as well as 20 extra days with reversed torus field.

Proposal: PR12-12-002 **Scientific Rating:**
Recommendation: C2 Conditional

Title: A study of meson and baryon decays to strange final states with GlueX in Hall D

Title: "A study of meson and baryon decays to strange final states with GlueX in Hall D"

Spokespersons: Curtis Meyer

Motivation:
This proposal is an extension of the already approved GlueX experiment on meson spectroscopy to include the detection and study of final states channels with open and hidden strangeness. The main motivation for such a study is the fact that a complete understanding of the hybrid meson spectrum requires a systematic amplitude analysis of many different hadronic final states, some of which include kaons. Furthermore the identification of strange baryons above 1.6 GeV may turn out to be crucial to an understanding of the 6 GeV CLAS results on excited nucleons and deltas.

Measurement and Feasibility:
The collaboration proposed to develop a kaon identification system to cleanly select meson and baryon decays that include kaons. Two possible detector designs are illustrated in the proposal: a threshold Čerenkov counter and a RICH. Other designs are also being considered by the collaboration, the final choice being expected in the next months. The collaboration is also planning to implement a level-three trigger which will be based on a new computing farm consisting of 2000 cores. With this upgraded setup they plan to collect 200 days of physics data at an average intensity of 5×10^7 tagged photons on target per second. The proposed experiment is feasible if the desired performance of the kaon identification system can be achieved.

Issues:
The final choice of design for the kaon identification system will be crucial for the success of the experiment. The proposed alternatives provide different kinematical coverage in kaon momentum and polar angle. They differ considerably in the time and resources required to design and build and also on the impact of the additional material on the reconstruction of photons and charged particles.

Summary:
GlueX is the flagship experiment in Hall D; the theoretical motivation for the proposed extension of running is very sound. However the success of the experiment depends crucially on the final design of the kaon identification system. The PAC39 therefore recommends C2 conditional approval, contingent upon the final design of the particle ID system.

Proposal: PR12-12-003 **Scientific Rating:**
Recommendation: Defer

Title: Symmetry Tests of Rare Eta Decays to All-Neutral Final States: The Jlab Eta Factory (JEF) Experiment

Spokespersons: L. Gan, D. Mack, A. Somov

Motivation:
The main goal is to tighten the present constraints on new sources of charge conjugation invariance C, Parity violation P, and CP violation in hadron decays. Rare neutral decays of the eta meson provide a unique flavor-conserving laboratory to search for new sources of C, P, and CP violation and to test predictions of chiral perturbation theory at higher order. The proposed experiment will reduce by one order of magnitude the existing upper limits on the branching ratios of two channels that are forbidden in the Standard Model: $\eta \rightarrow 2\pi^0$ (P and CP forbidden) and $\eta \rightarrow 3\gamma$ (C forbidden).

Measurement and Feasibility:
The experiment appears to be feasible and is well suited for the tagged Hall D photon beam. The beam conditions required, such as the electron beam current, the radiator and the collimator, are similar to those of the approved (PAC37) PRIMEX experiment. In contrast with PRIMEX, no accurate luminosity measurements are needed.

Issues:
The experiment requires a major upgrade of the standard Hall D equipment including the replacement of the lead glass forward calorimeter (FCAL) with a new high resolution PbWO calorimeter with flash ADC readout on every crystal. The PAC has concerns about costs and people-power. The cost of such a calorimeter is expected to be on a scale of several millions and will need considerable manpower to operate and maintain it. The PAC also felt that the physics case for this large instrument could be strengthened. On one side, the flagship physics case — testing the standard model — would be sharpened by removing focus from the more model-dependent results and concentrating on the cleanest standard model tests. On the other side, the PAC would like to see more exploration of the broader, secondary physics program that the new calorimeter could support, e.g. what could be learned from the angular distributions of other (non-forbidden) all-neutral final states as measured by this high-resolution device?

The PAC's present charge defines "approval" of an experiment as placing it in the "top half of the priority list for the first 5 years of 12 GeV running". This promising but ambitious project did not make a convincing case that it would be able to run that quickly. The proposed JEF and GlueX itself are unique in the world; with no competition envisioned, this new undertaking seems suited for a later phase of Hall D running than that covered by PAC39's charge.

Recommendation: Defer
We encourage the proponents to carry out a more detailed study of the cost and required people-power for the new PbWO calorimeter. We also encourage them to include the new device in the ongoing design studies for upgrading GlueX's forward particle identification (Threshold Cerenkov counter vs RICH). All experiments in Hall D will likely benefit from the availability of an improved forward particle identification system.

Proposal: PR12-12-004 **Scientific Rating:**
Recommendation: C2

Title: C-REX: A Parity-Violating Measurement of the Weak Charge Distribution of 48Ca to 0.03 fm Accuracy

Spokespersons: S. Riordan (contact), J. Mammei, R. Michaels, K. Paschke, P. Souder

Motivation:
The experiment aims to measure the neutron radius of ^{48}Ca by parity violating, PV, electron scattering mediated by the weak charge of the nucleus. This experiment is an extension to the PREX-II experiment that was approved by the last PAC. The difference in proton and neutron radii is a key observable that is predicted by nuclear models, but normally is not precisely determined experimentally. It is related to isospin dependent components of the nuclear force, such as the density dependence of the nuclear symmetry energy or three nucleon interactions. In this case, a measurement of the neutron to proton radius in ^{48}Ca will provide a key observable that can be used to test and constrain microscopic nuclear models. This is in contrast to the PREX-II result that will primarily be used to constrain density functional theory. This measurement will provide a benchmark and a key test for many nuclear models. Furthermore, recent publications have shown a correlation between the neutron radius in ^{48}Ca and ^{208}Pb, hence this measurement will provide a check of the result obtained in PREX-II

Measurement and Feasibility:
The asymmetry for single polarized electron scattering at a fixed Q^2 is a measure of the ratio of the weak to Coulomb form factors and hence is sensitive to the neutron radius of the nucleus since the weak charge of the proton is small compared to that of the neutron. In a 40 day experiment it is expected that a measurement of the size of the neutron distribution in ^{48}Ca can be determined to 0.03 fm. The experiment is proposed to run at 2.2 GeV in order to optimize the kinematic conditions to make the measurement most sensitive to the neutron size. A new septum magnet is needed for the higher energy electron beam used in C-Rex compared to P-Rex and the smaller scattering angle. Otherwise the setup is the same. The proposal included simulations that demonstrate that the radiation damage will be less than the P-Rex experiment and hence once PREX-II is run, this experiment will be demonstrated to be feasible provided the potential target issues are overcome. The target can be tested using natural calcium at the time of the PREX-II experiment.

Issues:
The main question is: why repeat the PREX-II measurement with another nucleus? While the PAC believes that a strong case can be made based on the fact that a measurement on ^{48}Ca can be used to test microscopic models and confirm the PREX-II result, the current proposal did not convincingly make this case. No microscopic calculations for ^{48}Ca were provided in the proposal and the arguments for how the experiment would test three nucleon effects were only indirect. The case for the measurement based on figure 2 of the proposal was not convincing since the experimental error bars will be large compared to the spread of the theoretical predictions. The arguments to test anomalies in transverse parity violation and the connection to atomic parity violating experiments were not viewed as convincing.

A second, minor point is that a complete design of the septum magnets should be used to simulate acceptance and track reconstruction in detail, proving that the required accuracy (e.g., in average Q^2) can be reached.

Recommendation:
The experiment is conditionally approved, with a C2 status. The proponents should return to a future PAC with a proposal that makes a stronger case demonstrating how the ^{48}Ca result will test microscopic models.

Proposal: PR12-12-005 **Scientific Rating:**
Recommendation: Deferred

Title: The Longitudinal Photon, Transverse Nucleon, Single-Spin Asymmetry in Exclusive Pion Electroproduction

Spokespersons: D.J. Gaskell, F.W. Hersman, G.M. Huber, Dipangkar Dutta

Motivation:
This experiment proposes to measure the transverse target single–spin asymmetry of the longitudinal photon cross section, $\sigma_L(S^T=\uparrow) - \sigma_L(S^T=\downarrow)$, in the exclusive electro-production of negatively charged pions on the neutron, e $n\uparrow$ (in ^{3}He) $\rightarrow$ e' π- p. This observable is sensitive to the nucleon helicity–flip pseudoscalar generalized parton distribution (GPD) Etilde, which contains a dominant contribution of the pion-pole. This is a fundamental input for the understanding of the charged pion form factor and the cleanest manifestation of the effect of chiral dynamics on the nucleon's partonic structure.

Measurement and Feasibility:
The planned experiment would use a novel polarized ^{3}He target to serve as an effective polarized neutron target and the HMS and SHMS spectrometers in Hall C to detect respectively, electrons and pions. The experimental method is performed in two steps. First one has to isolate the sin β Fourier component of the cross section for a transversely polarized nucleon. β is the azimuthal angle around the virtual photon direction between the target polarization vector and the hadron reaction plane. Second one has to perform a Rosenbluth separation to select only longitudinal photon contribution.

To perform such a delicate experiment with a good accuracy in a reasonable time a very high luminosity as 5×10^{37} $cm^{-2}s^{-1}$ is required. This is 10 times more than the luminosity used with the proposed upgraded Hall-A polarized ^{3}He target. This experiment proposes to use a new high luminosity polarized ^{3}He target with a 10cm long cell which tolerates the full 80μA maximum beam current delivered by JLab 12 GeV.

Issues:
If the tricky experimental procedure is well under control (accurate knowledge of the acceptance in β which is also common with the charged pion form factor experiments, choice of same target window background for the different epsilon measurements…), the experiment requires a new high pressure, cryogenically cooled polarized ^{3}He target that will operate at a luminosity of one order of magnitude higher than the *proposed* upgraded Hall-A polarized ^{3}He target. The technical realization and operation of such a high luminosity polarized ^{3}He target is really challenging and deserves to be demonstrated. A fully operational, automated, laboratory prototype is being developed in Xemed's lab. A prototype version of this new generation target is already operational at somewhat lower pressure, 150 psig suction and 1000 psig discharge, but has to be extended by a new version at 300 psig suction and 3000 psig discharge. Moreover the polarization lifetime (to maintain 65% polarization) remains an important issue.

Recommendation: Deferred
The scientific case is really worthwhile. However, in view of many technical issues for this very challenging high luminosity polarized ^{3}He target, the proposed experiment cannot be part in the top half of the priority list of experiments to be established for the first 5 years of 12 GeV operations. The PAC encourages the group to pursue all these technical efforts to provide later a new generation of high luminosity polarized ^{3}He target from which several other experiments can benefit.

Proposal: PR12-12-006 **Scientific Rating: A-**
Recommendation: Approved

Title: Near Threshold Electroproduction of J/Psi at 11 GeV

Spokespersons: Z.-E. Meziani (contact), K. Hafidi, X. Qian, N. Sparveris

Motivation:
This proposal describes an experiment to measure electroproduction of J/Ψ mesons at kinematics near production threshold. These measurements are of particular interest in probing the gluonic dynamics of hadron interactions in the low-energy regime. Theoretical models consider mechanisms of two- or three-gluon exchange, the latter of which might be dominant near threshold and lead to enhanced cross sections. Existing data in this region are sparse and inconclusive. Eventually, the gluonic potential between the charmed meson and the nucleon, if attractive, opens up the possibility of experimentally observing J/Ψ-nucleon bound states.

Measurement and Feasibility:
The collaboration proposes to carry out the experiment in Hall A at 12 GeV using the SoLID spectrometer and a liquid hydrogen target. All 4 particles in the final state – scattered electron, recoil proton and e^+e^- from the J/Ψ-decay – will be detected in coincidence. The angular distribution of the J/Ψ-decay can also be measured and might shed more light on the production mechanism. To optimize the acceptance, several changes of the proposed SoLID-SIDIS setup are required, including an enlarged opening of the magnet front yoke as well as position and size of the GEM detectors. The proposal contains a careful study of the main backgrounds and main uncertainties in the projected cross section. The experiment seems feasible. Compared with a similar measurement proposed within PR12-12-001 the sensitivity to small cross sections is substantially higher. Therefore, the measurement proposed here is particularly important, if the enhancement of the cross section near threshold, mentioned above, should not occur.

Issues:
The PAC is concerned about the proposed modifications of the SoLID setup and strongly recommends trying to come up with a common solution appropriate for the whole SoLID program, if possible.

Recommendation:

The PAC approves 60 days of beam time for this proposal with scientific rating A-.

Proposal: PR12-12-007 **Scientific Rating: B+**
Recommendation: Approved

Title: Exclusive Phi Meson Electroproduction with CLAS12

Spokespersons: F.-X. Girod, M. Guidal, A. Kubarovsky, V. Kubarovsky, P. Stoler, C. Weiss

Motivation:
The proposal aims to study exclusive ϕ meson electroproduction above the resonance region for momentum transfers up to 12 GeV^2. The primary aim is to study the model independent features of the reaction mechanism in the small size regime, such as Q^2 scaling and the Q^2 independence of the t-slopes. Furthermore, the measurement will allow to access the gluonic radius of the nucleon in the valence region, nicely complementing studies at HERA in the small-x region. Signatures of possible intrinsic ssbar components in the nucleon can also be explored by this experiment.

Measurement and Feasibility:
The experiment will use the upgraded CLAS12 detector, an 11 GeV highly polarized electron beam, and an unpolarized hydrogen LH_2 target. The large acceptance of CLAS12 will allow simultaneous detection of the scattered electrons and the ϕ meson decay products allowing for an exclusive measurement of the process. Furthermore, the study of the ϕ meson angular decay distribution will allow to test the s-channel helicity conservation and infer in this way an L/T separation. The experiment will build upon the expertise gained with the 6 GeV program. Detailed simulations demonstrate that the proposed measurements seem feasible and can run simultaneously with already approved experiments to measure deeply virtual Compton scattering and pseudoscalar meson electroproduction. The requested beamtime of 60 days is smaller than the previously approved beamtime for the deeply virtual Compton scattering experiment.

Issues:
There are no major issues

Recommendation: Approved
The PAC approves the experiment for the requested amount of 60 days.

Proposal: PR12-12-008 **Scientific Rating:**
Recommendation: C2

Title: Photoproduction of the Very Strangest Baryons on a Proton Target in CLAS12

Spokespersons: Lei Guo, Michael Dugger, Dan Watts, John Goetz, Eugene Pasyuk, Igor Strakovsky, Veronique Ziegler

Motivation:
This is a proposal to study the photoproduction of Omega and Cascade baryons using exclusive reactions in CLAS12. The proponents plan to carry out a comprehensive set of measurements which include the photoproduction cross-section of Omega and Cascade baryons, the mass splitting of ground-state and excited cascades, the polarization and spin-parity information of Ξ baryons, with the ultimate goal to shed light on the production mechanism of these S = -2 and S = -3 baryons.

Measurement and Feasibility:
The proposed experiment will be run in parallel with the already approved CLAS12 meson spectroscopy experiment (E12-11-005) and is expected to yield ~ 7000 Omega and several millions Cascade baryons. These predictions are based on fast Monte Carlo simulation with parametrized detector response and a simplified background estimation.

Issues:
This proposal does not require additional time or equipment with respect to the already approved CLAS12 meson spectroscopy experiment. However the simulations carried out to support the proposal are of insufficient detail to judge its feasibility. In particular the background estimation is based on overly optimistic assumptions about pion and kaon identification.

Recommendation: C2:
The motivation of the proposed measurement is sound and it fits very well within the physics interest of the 12 GeV run. Given the issues raised above the PAC39 recommends C2 approval, contingent on the achievement of more detailed simulations and a more realistic background evaluation.

Proposal: PR12-12-009 **Scientific Rating: A**
Recommendation: C1 Conditionally Approved

Title: Measurement of transversity with dihadron production in SIDIS with transversely polarized target

Spokespersons: H. Avakian, S. Anefalos Pereira, A. Courtoy, M. Radici, L. Pappalardo, K. Griffioen

Motivation:
The proposal aims at obtaining the collinear transversely polarized quark distribution h1(x) in a SIDIS experiment that studies two-hadron final states.

Measurement and Feasibility:
The data taking for this measurement, 110 days at 11 GeV in Hall-B, is done in parallel with other experiments that aim for the measuremnt of TMD functions for a transversely polarized target ("Transverse spin effects in SIDIS at 11 GeV with a transversely polarized target using the CLAS12 Detector", C12-11-111) and a DVCS measurement ("Deeply Virtual Compton Scattering at 11 GeV with transversely polarized target using the CLAS12 Detector", PR12-12-010). The measurements on transversely polarized targets, in particular also hydrogen, is important because half of the nucleon TMDs at 'leading twist' require such polarization. The most essential issue to enable the experiments, therefore, is the feasibility of a HDice target (see issues). The large acceptance of CLAS12 is essential to provide us with the global picture, which will be important for the Hall-C SOLiD measurements.

Issues:
The PAC was impressed by the progress that has been achieved with HD-ice target and the successful run with the photon beam. For the proposed program with a transversely polarized target using an electron beam in CLAS12, an early test measurement is necessary after turning on the CLAS12. One has to achieve at least WITHIN a factor of two of the figure-of-merit required by the physics program (I = 1nA and 60% polarization), and a spin relaxation time of 50 days or longer with a 1 nA electron beam on the target before CLAS12 experiments with the transversely polarized HDice target can be fully approved.

Recommendation: C1 Conditionally Approved
The PAC approves this proposal with the condition on the HDice target.

Proposal: PR12-12-010 **Scientific Rating: A**
Recommendation: C1 Conditional

Title: Deeply Virtual Compton Scattering at 11 GeV with transversely polarized target using the CLAS12 Detector

Spokespersons: H. Avakian, V.D. Burkert, L. Elouadrhiri, M. Lowry, M. Guidal, S. Procureur

Motivation:
The main goal is to measure target single spin asymmetry in the DVCS reaction on transversely polarized target. This will provide access to the GPD and in particular to the GPD-E and from it to *u* and *d*-quark contributions to the total orbital angular momentum. Measurements of t-dependence provide information needed for transverse nucleon imaging. Such distributions are predicted in recent lattice calculations. Extracting quantitative information on quark angular momentum from exclusive measurements is generally regarded as extremely challenging.

Measurement and Feasibility:
Proposed experiment will use CLAS12 in standard configuration with transversely polarized HDice target. The current of electron beam should be around 1 nA to keep target at low temperature and luminosity about 5.10^{33} $cm^{-2}s^{-1}$. The simulation of the background has shown that running in such conditions is possible. Configuration of magnetic fields around the target have been very carefully optimized and resolution with final configuration determined. The scanning in 4 dimension is foreseen: *x*, Q^2, t and Phi. Special care have to be taken to remove Pi^0 background.

Issues:
For the program with a transversally polarized target at an electron beam in CLAS12 an early test measurement is necessary after turning on the 12GeV. One has to achieve at least WITHIN in a factor 2 the figure-of-merit determined by the target design value (I=1nA and 60% polarization) and a spin relaxation time of 50 days at 1 nA before the experiments with the transversally polarized target are approved.

Recommendation: Conditional Approval (C1)

Proposal: PR12-12-011 Scientific Rating:
Recommendation: Deferred

Title: Measurements of $A_{\parallel}$ and $A_{\perp}$ to Extract G_M^n and G_M^n at Q^2 = 1-2.6 (GeV/c)^2 from the Inclusive polarized ^{3}He(e, e2) Reaction

Spokespersons: T. Averett, D. Higinbotham, V. Sulkosky, B.E. Norum

Motivations:
This proposal is about inclusive double spin asymmetry measurements using a longitudinally polarized electron beam and a polarized ^{3}He target in order to extract the neutron electric and magnetic form factor at a Q^2 range of 1.1 to 2.6 (GeV/c)^2. From the test data taken previously during the running of experiment E05-102 in Hall A with the polarized ^{3}He target, such a technique was attempted for the first time at a Q^2 value of around 1.0 (GeV/c)^2. The extracted value of G_M^n with a rather large statistical uncertainty is consistent with values extracted from other experiments.

While effects from final state interaction and meson exchange currents are expected to become smaller as the value of Q^2 increases, relativistic effects on the other hand will become larger. This seems to be under control with a number of theorists on board with different theoretical approaches. The effect due to inelastic (DIS) contribution to the QE asymmetries has been estimated. The proposed experimental technique seems sound.

Due to the lack of a free neutron target, the PAC recognizes the importance in carrying out measurements of G_M^n using two different experimental techniques employing two different effective neutron targets: a double-spin asymmetry with a polarized ^{3}He target, and recoil neutron polarization measurement using an un-polarized deuterium target. The PAC is also convinced that the lab should only do one such experiment using each of the aforementioned techniques as part of the top half of the first five years of the 12-GeV running because the PAC does not believe additional value will be added by performing a second experiment using the 'same' experimental technique with the same effective target keeping in mind the overall goal of producing high-impact 12-GeV physics results in the early phase of the 12-GeV running. The PAC appreciates the high precision one can achieve with the two lowest values of Q^2 in a rather short amount of beam time and such measurements may even be beneficial to the approved experiments A_2^n (E12-06-110) and d_2^n (E12-06-121) experiments. Therefore, the PAC encourages the proponents of this experiment to possibly work out a plan with these presently approved experiments so that data may still be collected for in this Q^2 region.

Measurement and Feasibility:
The proposed experimental technique seems sound. However, the experiment is proposed with the next generation of the highly successful polarized ^{3}He target, which is a 60-cm long target at an incident beam current of 40 μA. Therefore, there is some risk associated with the proposed Figure-of-Merit of this target.

Proposal: PR12-12-012 **Scientific Rating:**
Recommendation: Deferred

Title: Measurement of the Ratio G_E^n / G_M^n by the Double-polarized ^{2}H($\vec{e}$,$e'\vec{n}$) Reaction

Spokespersons: J. Annand, B. Wojtsekhowski, N. Piskunov, and V. Bellini

Motivation: This proposal is a follow-up upon a previously deferred proposal, PR12-11-001, on measuring the ratio of G_E^n / G_M^n in order to extract the electric form factor of the neutron by measuring recoil neutron polarization from the quasi-free d(e,e′n) process using a longitudinally polarized electron beam and an unpolarized deuteron target.

Measurement and Feasibility: Quoting the relevant section from the PAC37 report concerning PR12-11-001: "While we applaud the collaboration in proposing this experiment in Hall A using the recoil neutron polarimeter with the combination of BBS and SBS with excellent, proposed precision, the committee is not convinced that this experiment in its proposed four-momentum transfer region, has the high priority to justify approval for the top half of the first 5-year 12-GeV program. This statement is based on the proposed precision and kinematic reach of the already approved Hall A experiment E12-09-016 using a high-luminosity polarized ^{3}He target (which also will use the combination of the SBS and BBS), and of the proposed Hall C neutron recoil polarimeter experiment (E12-11-009). However, this proposed experiment may prove to be very valuable and important in the future, should the two aforementioned experiments at higher values of Q^2 discover something unexpected. The neutron analyzing power Ay is poorly known at the proposed energies. The collaboration plans to take analyzing power measurement in the near future at Dubna, which is highly recognized and supported by the committee."

While the collaboration had done a good amount of work concerning the recoil neutron polarimeter, particularly in addressing the spin precession through the SuperBigBite dipole, and in evaluating the effect of fringe fields, the planned test on measuring the neutron analyzing power has been delayed due to the unavailability of a polarized neutron beam at Dubna. The highest value of the proposed Q^2 points is now at 6 $(GeV/c)^2$, which overlaps with the higher Q^2 regions of the approved E12-11-009 and E12-09-016 experiments. For E12-09-016 and E12-11-009, PAC35 and PAC37 recommended different Q^2 values than those proposed and approved different ~~approved~~ beam times from what was requested. Therefore, the projected measurements of these two approved experiments need to be updated and compared with. This was not possible for the proponents because such updated projections were not available at the time of this PAC.

Issues:

(1) There are still remaining concerns regarding the angular and energy resolution, the selection of the good quasielastic events, and dilution of analyzing power of the polarimeter due to high background rates on the calorimeter.

(2) The effective FOM of the neutron analyzer will be lower because QE neutrons from the target have a probability of about 25% to have a scattering in the scintillators of the analyzer, but they have a practically 100% efficiency to make a signal in the calorimeter.

(3) The effective analyzing power of the proposed polarimeter can be quite different for up/down and left-right scattering due to different backgrounds and geometry, and different detector operating conditions. Such a difference will be difficult to correct for by simulations, and a dedicated experiment might be needed.

Summary: Due to lack of a free neutron target, the PAC recognizes the importance in carrying out measurements of G_E^n using two different experimental techniques employing two different effective neutron targets: a double-spin asymmetry with a polarized ^{3}He target, and a recoil neutron polarization measurement using an unpolarized deuteron target. The PAC is also convinced that the lab should only do one such experiment with high precision using each of the aforementioned techniques.

Proposal: PR12-12-013 **Scientific Rating:**
Recommendation: Deferred

Title: Measurement of 19F(γ,α)15N with a bubble chamber and a bremsstrahlung beam

Spokespersons: C. Ugalde (contact), R. Holt, R. Suleiman

Motivation:
There are two motivations presented for this experiment. One is to test the suitability of using the CEBAF injector to determine the rate of the astrophysically important reaction $^{12}C(\alpha,\gamma)^{16}O$. The determination of this rate is perhaps the most important open problem for stellar evolution models as it determines many features of stellar evolution including the lower mass limit for formation of a black hole and the ratio of carbon to oxygen in the universe. The second motivation is to determine the site of ^{19}F production in the Galaxy. Fluorine is one of the few lighter elements whose origin in the galaxy is unknown. Recent observations of post-AGB stars show significant amounts of fluorine, but these observations cannot be reproduced by nucleosynthesis models. A possible explanation could be a severe underestimation of the reaction rate of $^{15}N(\alpha,\gamma)^{19}F$.

Measurement and Feasibility:
The experiment will use a novel approach employing bubble chamber technology. Alpha particles produced from a (γ,α) reaction would trigger a bubble that is detected by a camera. The chamber is relatively insensitive to gamma rays; hence very low cross sections can be determined. This technique has the capability to determine (α,γ) reaction rates at astrophysical energies if the backgrounds are low enough. This proposal is to measure the $^{19}F(\gamma,\alpha)^{15}N$ reaction at 9 energies with a bremsstrahlung end point from 4.55 to 5.35 MeV. This would cover a region above, but including part of astrophysically interesting range. The experiment will use a Penfold-Leiss decomposition to extract the energy dependence of the (γ,α) reaction rate.

The collaboration has preformed preliminary measurements at the HIGS facility, but background from high-energy bremsstrahlung photons from HIGS limits the lowest cross section that can be measured to about 1 nb. At JLAB they would not have the background observed at HIGS because the photons are produced with low energy electron beams.

This proposal is a follow-on to the letter of intent submitted to PAC38 describing the intent to measure the $^{12}C(\alpha,\gamma)^{16}O$ reaction rate. The PAC viewed a test run of this reaction as very important.

Issues:
The PAC views the primary motivation for these measurements is to test the suitability of performing the $^{12}C(\alpha,\gamma)^{16}O$ at JLAB. However, the current experiment will not test all the backgrounds since the two targets are different and the energy range is somewhat different. Success or failure of a measurement of $^{19}F(\gamma,\alpha)^{15}N$ would not guarantee or rule out success at a determination of $^{12}C(\alpha,\gamma)^{16}O$. The PAC had concerns that strong low-energy resonances in the $^{19}F(\gamma,\alpha)^{15}N$ reaction may confuse a proper background determination at the low cross section level required. As a stand-alone experiment, the motivation to determine the site of ^{19}F production is good, but the proposal did not convincingly make that case that a measurement with the required precision to resolve the astrophysical questions could be made. The proposal did not quantify the errors in a measurement of resonant and non-resonant cross sections, nor did it provide an estimate of the level of information needed for a resolution of the problem of the origin of ^{19}F.

Recommendation:
Defer the current proposal and encourage the proponents to come back with another proposal that would either more completely demonstrate that the $^{16}O(\gamma,\alpha)^{12}C$ reaction can be measured with sufficient accuracy using a bremsstrahlung beam at JLAB or demonstrate the astrophysical importance and accuracy of the information obtained for $^{19}F(\gamma,\alpha)^{15}N$. A future proposal would benefit from a presentation of the proposed measurements in the context of a broad picture.

Discretionary time directed aimed at testing $^{16}O(\gamma,\alpha)^{12}C$ might be warranted if there are resource available prior to the next PAC.

Proposal: C12-11-006 **Scientific Rating:** A
Recommendation: C1 Conditionally Approved

Title: Status of the Heavy Photon Search Experiment at Jefferson Laboratory

Spokespersons: M. Holtrop, J. Jaros, and S. Stepanyan

Motivation:
This proposal aims to search for a light vector boson, A′, in the broad mass region 10-1000 MeV with weak coupling of about 10^{-3}e or smaller. Such a vector boson would couple to charged leptons via mixing with the photon and could be produced by radiation of electrons in scattering or decay processes. Its decay would produce a very narrow resonance in the invariant mass e^+e^-spectrum. If the coupling is very small, the vector meson lifetime can be long enough for a displaced vertex of the particle to be detected. Because of the small coupling and small production cross-section, the JLAB electron accelerator with its extremely high intensity and large duty factor is well matched to such a search.

The proposed search is motivated in part by models trying to explain inconsistencies observed in astrophysical data and connect them with dark matter interactions. It is very interesting, probing for a possible new force that is well within the realm of credible ideas for physics beyond the standard model. Part of the plane of coupling versus mass of the boson has already been excluded by previous experiments, but this proposal would cover a significant region of the favored parameter space. Included in its discovery capabilities is the entire band of masses and couplings that would solve the 3.6 sigma discrepancy between theory and experiment observed in the Brookhaven muon g-2 experiment. The PAC views that particular feature of this proposal as very compelling. In fact, if the muon g-2 favored mass and coupling range turns out to be realized, a discovery would be made quickly. If a null result is obtained, a significant region of light vector boson masses will be eliminated and a currently viable solution to the muon g-2 discrepancy will be ruled out.

This experiment has the potential to make a revolutionary discovery if carried out in a timely manner. Even in the event that other experiments are completed first, this experiment has the unique capability of exploring very small couplings because of its vertexing capabilities.

The experiment was already conditionally approved in PAC37 (Conditional Approval 2, requiring a return to the PAC). The physics motivation has not changed, and remains as strong as it was at that time. In fact, as LHC results continue to restrict the available parameter space in dark matter SUSY searches, the interest in other potential channels for the discovery of dark matter continues to grow.

Measurement and Feasibility:
The envisioned experiment is very ambitious. It requires extremely high rates and is potentially vulnerable to unforeseen backgrounds. A test run was requested by the collaboration to check out the detector and its various components. During the final month of 6 GeV CEBAF operation, which occurred this year, the collaboration installed a substantial fraction of the detector setup and engaged in a beam test in Hall B with the operating photon beam. Although the conditions were much milder than the proposed electron beam operation, the collaboration was able to study trigger rates and compare to Monte Carlo simulations from EGS and GEANT. The comparison at this raw level showed that, as a first pass, there appears to be a reasonable agreement between the measured rates and the simulations. Although there is still a substantial amount of work needed to get from this first test run to a full operation of the experiment, the view from the PAC is that the experiment should be promoted to the next level: Conditional Approval 1, which does not require a return to the PAC, but leaves it to the laboratory management to conduct a technical review of the experiment and to schedule beam

time based on the experiment's readiness. The PAC urges the HPS Collaboration to convince the laboratory to schedule an early test run with electron beam. Ideally, the test run could be performed as soon as beams restart in Hall B, not only to ensure efficient progress toward the full experiment but also to provide an early, high-impact result from 12 GeV operation, thanks to the impressive anticipated reach of the test experiment. The Collaboration should proceed in the meantime to seek funding and acquire the equipment for the full experiment.

Issues:
The proposed experiment's discovery capabilities cover a very broad range of masses and couplings for a new light boson. It has significant potential for a discovery that can change our picture of particle interactions. It could possibly provide a portal for exploring dark matter properties in the laboratory. Even if a signal is not seen, the experiment will constrain the allowed values of new boson masses and couplings, and thereby provide important new constraints on the domain of possible new physics. A negative finding would even eliminate one currently viable solution to the muon g-2 discrepancy. In addition, the experiment's access to regions of masses with low coupling constants is unique among the A′ experiments.

Proposal: C12-11-008 **Scientific Rating:** A
Recommendation: C1 Conditionally Approved

Title: A Proposal for the DarkLight Experiment at the Jefferson Laboratory Free Electron Laser

Contact person: Peter Fisher

Motivation:
This proposal aims to search for a light vector boson, A′, in the mass region 10-100 MeV with weak coupling of about 10^{-3} e or smaller. Such a vector boson would couple to charged leptons via mixing with the photon and could be produced by radiation off electrons in scattering or decay processes. Its decay would produce a very narrow resonance in the invariant mass e^+e^- spectrum or possibly an invisible, missing energy, decay mode. Because of the small coupling, a very high intensity electron accelerator is needed for the experiment. The FEL at JLAB is envisioned as a potentially useful facility for such a search because of its extremely high intensity and large duty factor. This idea was first submitted to PAC35 as a LOI and the collaboration was then encouraged to write a more detailed proposal. Subsequently a proposal was submitted to PAC37 in which the collaboration asked for C2 approval to perform beam tests and background measurements. This was granted and a beam test is scheduled for July of 2012. The collaboration is now seeking full approval contingent on the success of the beam test.

The proposed search is motivated in part by models trying to explain inconsistencies observed in astrophysical data and connect them with dark matter interactions through a possible new force that is well within the realm of credible ideas for physics beyond the standard model. Part of the plane of coupling versus mass of the boson has already been excluded by previous experiments, but the unexplored region available for the proposed experiment coincides with a domain of particular interest, because it could naturally explain the 3 sigma discrepancy between theory and experiment observed in the Brookhaven muon $g - 2$ experiment. The PAC views that particular feature of this proposal as compelling.

This experiment has the potential to make a revolutionary discovery if carried out in a timely manner. Otherwise, other less focused experiments are likely to explore this mass/coupling region first.

Measurement and Feasibility:
The feasibility of this measurement hinges on the utilization of the JLAB FEL as a high current source of 100 MeV electrons. Its operation in such a role presents technical and financial challenges, such as the beam halo profile, that must be studied and addressed in a beam test. The proposed measurement stands out from competing experiments at JLAB (APEX and HPS) and elsewhere in that the entire final state including the recoiling nucleus is reconstructed. This may also open up the possibility to look for invisibly decaying A′ bosons. An important by-product of the measurement (if a hydrogen target is used) would be a determination of the proton charge radius at Q^2 values down to 0.0019 GeV^2 or lower.

Issues:
The proposed experiment's discovery capabilities cover a very interesting range of masses and couplings for a light new boson. It has significant potential for a discovery that could change our picture of particle interactions. It could possibly provide a portal for exploring dark matter properties in the laboratory. Even if a signal is not seen, the experiment will constrain the plane of new boson masses and coupling's allowed and thereby provide important new constraints on the domain of possible new physics. It would even eliminate one currently viable

solution to the muon $g-2$ discrepancy. A window of opportunity exists, but to be competitive with other likely searches for the new light boson, this search must be carried out in a timely manner.

The PAC grants approval with a C1 condition. The PAC recommends that the DarkLight collaboration demonstrate to the lab that the FEL beam conditions and beam halo, in particular, satisfy the needs of the experiment and that a credibly experimental design be produced based upon the measurements made in the FEL test run. After characterizing the beam parameters, a full simulation of events and backgrounds for the final detector package should be performed and presented to the lab review committee who would then fully approve the experiment and remove the C1 condition.

Proposal: C12-11-102 **Scientific Rating:**
Recommendation: Deferred

Title: Measurement of the Ratio R = σ_L/σ_T in Exclusive and Semi-Inclusive π° Production

Spokespersons: T. Horn, R. Ent, H. Mkrtchyan

Motivation:

This proposal aims to provide the first longitudinal transverse (L/T) separation for the exclusive p(e,e'π°) p reaction and semi-inclusive p(e,e'π°) X reaction. This experiment is similar to the already approved experiments dedicated to the L/T separation of charged pion electro-production E12-06-104 and E12-07-105.

R_{Excl} is rather poorly known. It should be very small as only the non-pole contribution plays a role in neutral pion production. However it is an important quantity since factorization has only been proven for the longitudinal component σ_L of the pion production cross section, which is related unambiguously with GPDs.

The priority is given to the exclusive (versus semi-inclusive) π° production as advised by PAC38, however SIDIS data will be collected "for free". Verifying $R_{SIDIS} = R_{DIS}$ is a test of the dominance of the electron quark scattering followed by a quark fragmentation process and of the deviations from this leading order factorized picture.

Measurement and Feasibility:

This experiment would be performed in Hall C, using a $1\mu A$ electron beam incident on a liquid hydrogen target (some small amount of running on D was also proposed but seems marginal in value). Different beam energies (E=4.4, 6.6, 8.2, 8.8, 10.9 GeV) will be required for a good epsilon lever arm necessary for the L/T separation. The scattered electron is detected in the well-known high resolution HMS spectrometer while the construction of a general purpose neutral pion detection system cantilevered off the SHMS carriage and thus remotely rotatable from 6° up to 29° is foreseen.

The neutral-pion detector would consist of 1116 PbWO4 blocks (from the PRIMEX experiment), comprising a 25msr device at a distance of 4 meters allowing a full azimuthal coverage at small transfer *t* or small transverse momentum p_T. This detector would be equipped with new PMT bases and flash ADCs to cope with the high rates.

Specific actions are envisioned to reduce backgrounds:

1) The Horizontal-Bend Magnet of the SHMS would be removed to install a 0.3 T.m sweeping magnet (to remove Möller electrons).

2) A 5mm-thick, segmented scintillator counters would be installed in front of the PBW04 to reject high-energy charged particles not deflected by the sweeping magnet.

3) A dedicated beam pipe with as large critical angle as possible and shielding are foreseen to reduce backgrounds beyond the sweeping magnet.

Issues:

A detailed and realistic treatment of the pi0 detector had been achieved with a complete background simulation using GEANT with support from the Jefferson Lab RadCon group, including all possible backgrounds such as e+/e-, gamma, pi0, p and n. The PAC39 proposal added evolution of efficiency and background contamination as a function of the threshold. In particular, combinatorial backgrounds were demonstrated to be small (below about 4% even in the worst case). The codes used have been confirmed by actual experiments.

The PAC is concerned by the statistical error bars given on RExcl for which its values are expected rather small. The VGL predictions used in the projections are based on a Regge approach which is not valid at the large values of x_B explored at JLab. Presentation of a more realistic model for both σ_L and σ_T as for example from Goloskokov and Kroll, should give a better confidence in the projected errors.

The knowledge of the non-pole contribution relative to the dominant pole contribution is essential to the determination of the charged pion form factor through π^+ electro-production. However it is not clear if and how the precision of the proposed measurement of the non-pole contribution of π^0 impacts a determination of the non-pole contribution in π^+.

More generally, one would like to see a more quantitative discussion of the physics which will be addressed by a measurement of the L/T ratio of π^0 at large $x_{B.}$

Recommendation: Defer

Despite all the efforts which have been made to improve the presentation of this experiment, the PAC is not convinced by the position of this proposed experiment in the top half of the priority list of experiments to be established for the first 5 years of 12 GeV operations. The proponents of such a new and ambitious facility for photon detection in hall C could envisage a larger scope to the experimental program.

We refer the proponents to the introductory remarks from the chair at the beginning of this report, which describe the PAC's evolving mindset now that the extent of the 12 GeV backlog is established. The PAC's charge still defines Approval as "suitable for the top half of the priority list for the first five years". The GPD / hard-exclusive-processes area is well covered by the set of already approved experiments, which form a strong, high-impact program that is sufficient for the "top-1/2 first-5" period. New proposals that would further add to the backlog in a well-covered subject area like GPD studies cannot be approved under the present charge.

Proposal: C12-11-106 **Recommendation: Approval**
Scientific Rating: A

Title: High Precision Measurement of the Proton Charge Radius

Spokespersons: A. Gasparian (contact), M. Khandaker, H. Gao, D. Dutta

Motivation:
This is an updated proposal of PR12-11-106 which was conditionally approved by PAC 38. The goal of the experiment is to make a measurement of the proton charge radius to a precision of 0.5%. The proponents hope to resolve the "proton charge radius crisis", which is related to a new measurement of the proton charge radius from the Lamb shift in muonic hydrogen atoms that disagrees significantly (six sigma) from the CODATA value extracted from Lamb shift measurements of hydrogen atoms and from electron scattering experiments at laboratories including Mainz. The new experiment from muonic hydrogen Lamb shift, while significantly smaller, has a precision of 0.1%, four times better than other measurements. Testing of this result is among the most timely and important measurements in physics.

Measurement and Feasibility:
The collaboration proposes to determine the proton charge radius from a high-precision measurement of $e - p$ elastic scattering at very low four-momentum transfer squared, Q^2, from 10^{-4} to 10^{-2} $(\mathrm{GeV/c})^2$. They will use the Primex HYCAL ($PbWO_4$) calorimeter in hall B to measure .7 deg to 5 deg elastically scattered electrons from H in the target. For the measurement, they propose to use a cryogenically cooled 4 cm long windowless hydrogen gas target. The absolute value of the $e - p$ cross section will be monitored by Møller scattering off electrons in the target. This is a novel technique that should be able to achieve the required precision. The measurement is very challenging since it requires measurement of elastically scattered electrons very close to the beam axis with high precision.

The conditions posed by PAC38 before approval were related to a more careful modeling of beam halo with the exact target geometry proposed and all sources of background included. Interpretation of the measurement will require extension of radiative corrections down to 10^{-4} GeV^2 with the required precision. In addition, PAC38 was not convinced that all Coulomb effects with the required precision were properly included in the simulations presented.

The updated proposal has satisfactorily addressed all these issues. In particular, a measurement proves that a beam halo at a level of 10^{-7} a few mm from the beam spot is achievable. Also, the target configuration has been substantially improved. Detailed studies of Coulomb effects and radiative corrections have been performed.

Recommendation:
The PAC recommends approval of 15 days of beam time for this proposal and assigns a scientific rating of A.

Proposal: C12-11-108 **Scientific Rating:** A
Recommendation: A

Title: "Target Single Spin Asymmetry in Semi-Inclusive Deep-Inelastic (e, e′$\pi^{\pm}$) Reaction on a Transversely Polarized Proton Target"

Spokespersons: H. Gao, K. Allada, J.-P. Chen, X.Li, Z.-E. Meziani

Motivation:
This experiment will measure the semi-inclusive cross-sections for π^+ and π^-production from a transversely polarized proton target, using the large acceptance detector "SoLID" in Hall A. By mapping out the dependence of the target single spin asymmetry on the angle ϕ_h of the hadronic plane and the angle ϕ_S of the target spin (relative to the leptonic plane), one can extract three of the leading twist transverse momentum-dependent structure functions (TMDs) of the proton, as function of x, Q^2, z, and p_T. Measuring double spin asymmetries (with beam helicity) simultaneously, a fourth TMD becomes accessible. Together with already approved, equivalent measurements on ^{3}He(n) and on longitudinally polarized proton, deuteron and ^{3}He(n) targets, this type of experiment is crucial for a complete picture of the 3-D quark structure of the nucleon.

Measurement and Feasibility:
This proposal has been previously conditionally approved (C2) by PAC38. Since then, the proposers have essentially fulfilled all conditions for full approval. A preliminary design of the transverse polarized target was obtained from a potential vendor (Oxford Instruments), which shows that the necessary opening in the transverse direction can be achieved (albeit with a somewhat reduced conical acceptance of nominally 25° in all directions). Magnetic fields and forces were calculated using TOSCA, showing acceptable field homogeneity and forces on the target coils. The "sheet of flame" background was simulated in detail (GEANT3) and appears to be manageable with some modifications of the SoLID set up. Progress was made on detector design and hardware tests, although a final and complete engineering design of SoLID must still be completed and reviewed by a Jefferson Lab director's review. The PAC recommends that such a review should also include a detailed simulation of the expected signal and reconstruction of TMDs for the configuration proposed here, and should address issues raised by the TAC and ITR committee.

Issues:
The PAC is convinced that this experiment can achieve high statistical precision for TMD measurements on transverse targets, albeit with a more limited range in p_T (especially at higher Q^2) than the complementary experiment proposed for CLAS12 (PR12-11-111, see elsewhere in this report) and without reconstruction of charged kaons and neutral pions. We recommend that additional beam time be devoted to studies of the dilution factor as a function of all relevant variables, which should have little impact on the overall statistics. The proposers should also look into equipment safety issues that could arise if one of the two magnets suddenly changes field due to a quench.

Summary:
The PAC39, therefore, recommends full approval for 120 days with scientific rating A.

Proposal: C12-11-111 **Scientific Rating: A**

Recommendation: C1 Conditionally Approved

Title: Transverse spin effects in SIDIS at 11 GeV with a transversely polarized target using the CLAS12 Detector

Spokespersons: H. Avakian, F. Klein, M. Aghasyan, K. Joo, M. Contalbrigo

Proposal was conditionally approved (C2) at PAC38 with the following conditions:

1). The operation of the HD-Ice target in an electron beam with the requested beam current needed to be demonstrated.

2). The magnetic field and detector configuration needed to be optimized.

3). The track reconstruction code needed further development including the final configuration.

The PAC finds that Conditions 2) and 3), related to the extraction of the physics from the experiment, have been fully met. The main solenoid field has been reduced and the resulting operating luminosity is now limited to $L=5.10^{33}$ cm^{-2} s^{-1}, which ensures that the drift chamber occupancy is below a safe value of 1%.

The detailed account of the magnetic configuration has been included in the simulation where also full electromagnetic and hadronic background was taken into account. After reconstruction, predictions of the expected results and errors are presented.

Condition 1) is related to the successful operation of the target. The electron test run which would have addressed this condition could not be fully realized due to the high demand on the beam time for experimental measurements at the end of 6 GeV running.

The PAC was impressed by the progress that has been achieved with HD-ice target and the successful run with the photon beam. For the program with a transversally polarized target at an electron beam in CLAS12 an early test measurement is necessary after turning on the 12GeV. One has to achieve at least WITHIN in a factor 2 the figure-of-merit determined by the target design value (I=1nA and 60% polarization) and a spin relaxation time of 50 days at 1 nA before the experiments with the transversally polarized target are approved.

This test should be scheduled as soon as possible.

Letters of Intent

Letter of Intent: LOI12-12-001

Title: Letter of Intent: Measuring the charged pion polarizability in the gamma $\gamma\gamma \rightarrow \pi^+\pi^-$ reaction

Spokespersons: R. Miskinen

Motivation:
The proponents of this Letter would like to use the $\gamma\gamma \rightarrow \pi^+\pi^-$ cross section to obtain via crossing the $\gamma\pi \rightarrow \gamma\pi$ cross section using the Primakoff mechanism, which enables the extraction of polarizabilities for charged pions. The results also can shed light on discrepancies for the muon g-2.

Measurement and Feasibility:
The experiment would obtain the $\gamma\gamma \rightarrow \pi^+\pi^-$ cross section from $\gamma X \rightarrow X\pi^+\pi^-$ cross section from a 20 day measurements at 11 GeV in Hall D. There appears to be no problem to schedule such an experiment, which does not require any substantial modifications to existing infrastructure.

Issues:
The PAC advises the proponents to put the proposal in the broader context of two-pion production as advised in the Theory TAC. On the pion polarizabilities it is important to provide detailed sensitivity studies.

Recommendation:
The PAC does encourage the proponents to submit a proposal.

Letter of Intent: LOI12-12-002 **Scientific Rating:** N/A

Title: **"**Opportunity to Study the Rare Decay Process $\eta \rightarrow e^+e^-$ at JEF in Hall D"

Spokespersons: J. Leckey

Motivation: The proposed process is strongly suppressed within the standard model (beyond the reach of the proposed experiment). The aim is to push the existing experimental limit down by more than an order of magnitude, where non-standard model processes could conceivably lead to an observable branching ratio. However, no specific models for extensions of the standard model with **quantitative** predictions for this process are shown.

Measurement and Feasibility: The proposed experiment would add another channel to the proposed "JEF" facility (deferred Proposal 12-12-003) which is potentially interesting. However, the details given are too sketchy (even for a letter of intent) to give any clear indication whether the stated accuracy can be reached (and whether any interesting Physics should be expected at that accuracy). In particular, backgrounds could be very difficult to control at the required level.

Recommendation: The PAC believes that this channel could be part of a much strengthened future proposal for a "JEF" facility in Hall D if all issues can be addressed.

Letter of Intent: LOI 12-003

Title: Study with High Precision on Electro-production of Λ and Λ-Hypernuclei in Full Mass Range

Spokespersons: L. Tang (contact), F. Cusanno, F. Garibaldi, J.J. LeRose, P. Markowitz, S.N. Nakamura, J. Reinhold

Motivation:
This Letter of Intent provided a detailed summary of the hypernuclear program carried out at JLAB using the 6 GeV accelerator. It further asked for the PAC's view of continuing this program in the 12 GeV era. From the 6 GeV results it is clear that the program has had success in both hall A and Hall C. Precision data was obtained on many hypernuclei. To make the program more efficient in the future they propose to combine the previously separate hall A and Hall C efforts.

The potential physics that could be addressed by the program covers a wide range of topics. The study of the production process would complement larger CM angle photoproduction data taken at hall B. A search for the n Λ system is possible and has been a long standing goal of the field. A precise determination of the ^{4}H-Λ ^{4}He-Λ difference would measure the size of Charge Symmetry Breaking, CSB, would clarify CSB effects in the ΛN potential. A measurement of ΛN and ΣN mixing would provide information on the isospin dependence of the nuclear force. Study of states in p-shell hypernuclei would be useful for comparison to ab initio calculations of hypernuclei structure. In medium heavy hypernuclei (A=28 to 52) it would be possible to investigate the proper treatment of the single particle potential of the Λ in various orbits. In heavy Λ-hypernuclei, a bound hyperon could be isolated well inside the nucleus free from surface effects. Investigation of deeply bound hypernuclear states in heavy hypernuclei has significance in investigating if a hyperon keeps its identity and is distinguishable as a baryon in a nucleus or is dissolved as quarks.

Measurement and Feasibility:
JLAB can make a unique contribution to this field. For the JLAB program, electrons interact with protons to produce kaons and access more neutron-rich nuclei. In comparison, pion or kaon beams react with neutrons allow the study proton rich hypernuclei. Electrons also can interact anywhere in the nucleus and hence the hypernuclear state can be formed from neutrons in any orbit. This is in comparison to the hadronic probes that can not penetrate deeply and study Λ production more on the nuclear surface. By the nature of the production, the pion decay experiments can be performed with lower background than at MAMI.

The Letter outlined two options for continuing the program in either Hall A or Hall C. In Hall A the HRS spectrometer would detect electrons, the HKS spectrometer would detect kaons and the HES spectrometer would be used to detect decay pions. In Hall C the HES spectrometer would detect electrons, the HKS spectrograph kaons, and the Enge spectrograph would detect decay pions. While both options appear feasible, it is clear that in either case mounting these experiments would be a major undertaking as either Hall A or Hall C would have to be reconfigured.

Issues:
The estimate from the collaboration is that the program will require 6 weeks of beam time per campaign. Due to the significant investment of time and resources need to mount this program we think it is important that in preparation of future proposals, the proponents work closely with the theory community to identify the most

important cases for study. Future proposals should clearly state the impact of the measurements for our understanding of nuclear theory and on the determination of Λ-N interactions.

We also think that future proposals should provide an outlook for priorities of the program within the constraint of 6 weeks of beam time every few years. Proposals should concentrate on using the unique features of electron hypernuclear production and provide the context of how the measurements will complement other work in this field. We would also expect to see final results from the Mainz program of hyper-nuclear decay that demonstrates the backgrounds for the stopped kaon experiments are sufficiently low to allow the experiments to succeed.

Program Status

12 GeV Approved Experiments by Physics Topics

Topic	Hall A	Hall B	Hall C	Hall D	Total
The Hadron spectra as probes of QCD (rated) (GluEx and heavy baryon and meson spectroscopy)		1		1	**2**
The transverse structure of the hadrons (rated) (Elastic and transition Form Factors)	4	3	2		**9**
The longitudinal structure of the hadrons (rated) (Unpolarized and polarized parton distribution functions)	2	2	5		**9**
The 3D structure of the hadrons (unrated) (Generalized Parton Distributions and Transverse Momentum Distributions)	5	10	3		**18**
Hadrons and cold nuclear matter (rated) (Medium modification of the nucleons, quark hadronization, N-N correlations, hypernuclear spectroscopy, few-body experiments)	3	2	6		**11**
Low-energy tests of the Standard Model and Fundamental Symmetries (rated at PAC 37)	2			1	**3**
TOTAL	**16**	**18**	**16**	**2**	**52**

12 GeV Approved Experiments by PAC Days

Topic	Hall A	Hall B	Hall C	Hall D	Total
The Hadron spectra as probes of QCD (rated) (GluEx and heavy baryon and meson spectroscopy)		119		120	**239**
The transverse structure of the hadrons (rated) (Elastic and transition Form Factors)	144	85	102		**331**
The longitudinal structure of the hadrons (rated) (Unpolarized and polarized parton distribution functions)	65	120	140		**325**
The 3D structure of the hadrons (unrated) (Generalized Parton Distributions and Transverse Momentum Distributions)	409	982	108		**1499**
Hadrons and cold nuclear matter (rated) (Medium modification of the nucleons, quark hadronization, N-N correlations, hypernuclear spectroscopy, few-body experiments)	114	120	179		**413**
Low-energy tests of the Standard Model and Fundamental Symmetries (to be rated at PAC 37)	513			79	**592**
TOTAL	**1245**	**1426**	**529**	**199**	**3399**

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Charge to PAC39

1.) 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, based on what we know today, are of sufficient scientific merit that they will be included in the top half of the priority list to be established for the first 5 years of 12 GeV operations and recommend for approval. Also provide a recommendation on scientific rating and beamtime allocation for newly approved proposals.

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.

2.) The PAC will hear presentations from the Hall Leaders regarding the plans for commissioning the 12 GeV facilities and early physics running. **We request that the PAC comment on these plans, considering the likely status of the facilities during this early running period, but also the appropriateness of the choice of physics topics.**

3.) Given the current (and growing) backlog of approved experiments, we anticipate that it will be necessary to readdress priorities for scheduling the program (beyond the early running period discussed in 3.) above) at the beginning of the 12 GeV running period. The PAC should consider different options for re-evaluating the priorities in order to establish the highest impact program possible with the 12 GeV facilities. **We request that the PAC provide a recommendation on the procedure to be followed.**

[†] Letters of intent will be given the same "rights" to their scientific ideas as are currently afforded to deferred experiments