Department of Energy
Washington, DC 20585

October 15, 2008

Professor Steven M. Kahn
Director, Physics and Particle Astrophysics
Stanford Linear Accelerator Center
Mail Stop 29
P. O. Box 4349
Stanford, California 94309

Dear Steve,

I have enclosed the report on the Department of Energy, Office of High Energy Physics (DOE/OHEP) Science and Technology review of the Stanford Linear Accelerator Center (SLAC) held on July 7-9, 2008. It conveys our evaluation of the laboratory's performance, focusing on management's effectiveness and scientific programs, using the findings of the review committee and our assessments. It also provides guidance for your future program planning.

I would like to thank you and your staff for the hospitality shown the review team and for the quality of the review. The review proceeded smoothly and the presentations by the SLAC staff were polished, well organized and informative.

SLAC is entering a challenging era now that the B-Factory has completed operations and the LCLS becomes the major experimental facility on site. The opportunities in HEP at SLAC will center on GLAST operations, LHC research and support efforts both on site and at CERN, particle astrophysics research at KIPAC, and advanced accelerator research. You, your deputy, David MacFarlane, and your division heads are developing a coherent plan to manage these diverse activities and this effort will require continued diligence as the projects develop.

The review committee was generally favorably impressed by the review and its associated materials. They did, however, point out some areas for your consideration and they made some suggestions which may improve the quality of your program. The details of their findings, comments and recommendations can be found in attached report. Please address the review committee's suggestions and recommendations in a response to this office within the next three weeks.

We hope that the review report is helpful to you in planning the next several years of high energy physics activities at the lab.

Sincerely,

Dennis Kovar
Associate Director Office of
High Energy Physics

Report of the SLAC 2008 S&T Review

August 6, 2008

Executive Summary

The Stanford Linear Accelerator Center (SLAC) is in the midst of several challenging transitions. These include the change in stewardship from the Office of High Energy Physics (HEP) to the Office of Basic Energy Sciences (BES), the decommissioning and disassembly of PEP-II and the BaBar detector, and the startup of the Kavli Institute for Particle Astrophysics and Cosmology (KIPAC). In particular, 2008 marks the first time in the lab's history in which there will be no major high energy experimental facility on the site. The BES light source, Linear Collider Light Source (LCLS), is scheduled for commissioning within the next two years and it will become the highest priority experimental facility at SLAC. It is unclear whether SLAC can maintain world class programs in HEP and BES simultaneously given the lab's physical size and personnel constraints. The decommissioning of the B-Factory will present technical as well as managerial challenges to the lab. In addition to disassembling BaBar equipment, SLAC plans to redirect personnel to the LCLS and other Particle Physics Astrophysics (PPA) efforts, including its growing involvement with the US ATLAS collaboration at CERN's Large Hadron Collider (LHC), and its development of a computing and research center for US ATLAS. The development of KIPAC has been rapid and it faces challenges in managing its growth and integration with the more traditional high energy physics activities at the lab.

Furthermore, the lower than expected funding for the OHEP has caused unexpected contractions of the lab's HEP scope and personnel, and these cutbacks may adversely affect the lab's performance in the future. This review, which considered both the scientific and institutional aspects of SLAC, concentrated on the lab's performance and plans in light of these changes and challenges.

A twelve person review team was assembled at SLAC and met for 2 ½ days, July 7-9. They were given the task of addressing the lab's performance on seven topics singled out in the charge letter to SLAC management:

- B-Factory physics program, emphasizing run 7, and the plans to analyze the data accumulated over its life time;
- B-Factory shutdown and plans for the disassembly of BaBar and the minimum maintenance state of PEP-II;
- Participation in the LHC research program, both in the accelerator and the ATLAS experiment;
- Other ongoing experimental physics programs, including GLAST, EXO-200, etc.
- Theoretical particle physics and the KIPAC program in astrophysics, and cosmology, and the impact of these programs on the lab's experimental program;
- Advanced accelerator R&D facilities, including FACET and the NLTCA; and ongoing R&D including high gradient research and the ILC ;
- Research and development efforts to support the above programs and proposed efforts in EXO, LSST, SNAP, etc.

For each of these topics, the reviewers were asked to comment upon:

- Scientific significance and technical merit of the area

- Quality and impact of recent research in this area
- Competence and future promise for carrying out the proposed plan
- Adequacy of the allocated resources and cost-effectiveness of the investment
- Feasibility for carrying out the proposed plans
- Comparison with research at other laboratories

The reviewers were also instructed to provide overall evaluations of: (i) the quality of the support and infrastructure provided by the laboratory; (ii) the goals for the research program over the next three years, (iii) and the long-term research plan for the laboratory.

The impressions of the reviewers were formatted in a project-review style and are organized by topic in chapters in Sec. II of this report. The draft contents of these reports were presented informally to SLAC management at the review's closeout and were transmitted in detail to the lab after the review finished.

The reviewers had many favorable comments about the lab's scientific performance and the institution's organization and planning which are detailed in Sec. II. It also provided some critical comments and recommended action items, the most significant of which are:

1. The SLAC ATLAS group should work together with SLAC management, DOE, and US ATLAS to define the role of SLAC in ATLAS, including the proposed physics analysis center based at the laboratory.

2. The lab should develop a plan to provide adequate support of particle astrophysics theory's new and evolving computational needs.

3. Lab management should develop a five year strategic plan for accelerator research at SLAC compatible with DOE guidance on funding levels.

4. Future detector R&D, for SLHC, SuperB, and LC, and other new experiments, will need beam tests. SLAC should develop a case for a test beam facility and submit it to the DOE for evaluation.

5. The PEP-II D&D should be projectized, including putting PEP-II into a minimum maintenance state (MMS). The responsibility and management of the PEP-II D&D should be moved out of the PPA division, since the PPA's mission is science not D&D. PEP-II is better dealt with at the laboratory level.

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I. Introduction

The SLAC Program Review occurred over a 2 ½ day period, July 7-9, 2008 at SLAC. The review considered the lab's science and institutional accomplishments and plans for the next three years. The charge to SLAC management, the agenda of the review, talks and participants attending the review can be found in the Appendices to this report.

As was the case in other recent reviews of SLAC, the reviewers were impressed with the management's handling of the many challenging transitions and new initiatives occurring at the lab.

The primary reorganization of SLAC is its division into two disciplines: Photon Science under the guidance of the Office of Basic Energy Science (BES) and Particle and Particle Astrophysics (PPA) under the guidance of the Office of High Energy Physics (HEP). BES will assume stewardship of the lab in FY09 and the highest priority experimental facility at the lab will be the Linac Coherent Light Source (LCLS), the world's first free electron laser which uses the last 1/3 of the linac as an injector to an undulator that extends through End Station A (ESA) and bisects the PEP-II rings terminating at a Far Hall of experimental regions located just outside the ring itself. The PPA Division has access to the first 2/3 of the linac which it plans to use for electron beam driven plasma wakefield research, continuing in the tradition of the LCLS-displaced and dismantled Final Focus Test Beam (FFTB) facility. The lab has submitted a proposal for a project entitled "Facilities for Accelerator Science and Experimental Test Beams—FACET", to use the first 2/3 of the linac for a five year period to show that extraordinary gradients (>10GV/m) and high quality, high energy beams can be produced using plasma wakefields generated by a drive beam. The proposal also sketches out a second five year period of a follow-on project to demonstrate that the same physics can become the basis for a multi-TEV collider. PPA also has access to ESA where, as part of the FACET proposal, it has proposed the construction of a test beam facility to augment the heavily subscribed test beam facilities at FermiLab for detector development. This facility could be parasitic on the LCLS beam at the 1% level. The PPA's Next Linear Collider Test Area (NLCTA) is located in End Station B and is engaged in High Gradient (HG) research with an emphasis on warm structures, both metallic and dielectric, which can generate and maintain gradients in excess of 100 MV/m. Some of the HG work is done in collaboration with the Compact Linear Collider (CLIC) group at CERN.

It is not clear at this time how the plans of the Photon Science and the Particle and Particle Astrophysics divisions of the lab can co-exist and grow while avoiding conflicts for resources, given SLAC's limited space and personnel. This basic problem affects several of the particular transition activities singled out in the discussion below, and it adds complication and risk to each.

The many issues that the lab, and PPA in particular, faces include:

1. BaBar operations were terminated six months earlier than planned due to the funding shortfall provided by the Omnibus Funding Bill of 2008. The BaBar collaboration put together a plan to run PEP-II on the 2S and 3S bottomonium states and make an energy scan above the 4S state rather than continue to accumulate statistics on the 4S state as

originally planned. This plan has proved remarkably successful as the collaboration announced on July 7 the discovery of the elusive ground state, the η_b, of the bottomonium system.

2. BaBar now enters a period of 'intense analysis' of its 557.7 fb^{-1} data set. In addition, the detector itself will be disassembled and disposed of in the near future, with possible reuse of various components for the Italy-based Super-B project proposed by the Istituto Nationale di Fisica Nucleare (INFN), or other HEP research applications.

3. The PEP-II accelerator is now entering a minimal maintenance state (MMS) and there is interest from other efforts in the U.S. and abroad for some of its components. A proposal has been received from the University of Rome requesting approximately 70% of PEP-II components for reuse in the Super-B Factory mentioned in item 2 above. Coordination of the PEP-II D&D, the BaBar D&D and the potential Italian Super-B construction is an ongoing challenge. Some SLAC personnel have expressed strong interest in being collaborators on both the accelerator construction and detector development and operations of the Super-B facility, but these efforts are at an early and uncertain stage of development.

4. The Gamma Ray Large Array Space-based telescope (GLAST) was launched successfully on June 11, 2008 and has begun to transmit data to SLAC's Instrument Science Operations Center (ISOC). GLAST will operate for five years, with a possible extension to ten. GLAST is SLAC's first entry into space-based research and marks a watershed for their non-accelerator project ambitions as well as for multi-agency collaborations.

5. SLAC became a participant in the US ATLAS/LHC collaboration two years ago and is developing a Tier-2 Computation Center to support this effort. It has ambitions to become a West Coast intellectual center for LHC Research, using its collaborations with LBNL and UCSC to reach out to a wider collection of institutions. Personnel from BaBar are transitioning to ATLAS, so this effort is crucial for the lab to remain a major player in the U.S. accelerator-based research program. Past reviews have questioned the uniqueness and value-added of the SLAC effort within the US ATLAS group.

6. The Kavli Institute for Particle Astrophysics and Cosmology (KIPAC) has developed very rapidly over its five year lifetime. It is becoming the intellectual center for the non-accelerator research at the lab, including R&D on the proposed Large Scale Synoptic Telescope (LSST) and Supernova Acceleration Probe (SNAP). It receives funding from many sources, including the NSF, NASA and private foundations. The integration of KIPAC into the HEP mission remains a challenge. Since many of the research activities at KIPAC are outside the traditional scope of elementary particle physics, it is not easy to determine its appropriate funding level within the HEP program.

7. EXO-200 is a prototype experiment searching for neutrinoless double beta decay, which could establish the Majorana character of the neutrino . This measurement would be a major discovery in the field. In order to discover this extraordinarily rare process with certainty, the experiment must be done underground to reduce backgrounds.

EXO-200 is now running at the Waste Isolation Pilot Plant (WIPP) in Carlsbad, New Mexico. If successful, it may be superseded by a larger-scale experiment that could explicitly confirm the existence of neutrinoless double beta decay through Barium-tagging.

8. The Accelerator R&D efforts at SLAC are very diverse and have been organized into a Division headed by Tor Raubenheimer The efforts include X-band and L-band Klystron development, linear collider R&D, the study of warm structures to support High Gradient (HG) acceleration mechanisms (Next Linear Collider Test Accelerator – NLCTA), long term study of beam driven plasma wakefield acceleration (Facilities for Accelerator Science and Experimental Test Beams—FACET), direct laser acceleration, Large Hadron Collider (LHC) and LHC Accelerator Research Program (LARP) activities, Super-B design and R&D, and computer simulations of acceleration mechanisms. SLAC has been the world leader in linear collider technology and has unique facilites and personnel. No other national lab has comparable capabilities in these areas. SLAC wishes to preserve these facilities and personnel so that it can contribute to a new energy frontier, or intensity frontier construction project in the future. A serious issue facing the lab is the development of a plan in which these PPA experimental facilities can co-exist on a site where the BES present and future facilities have precedence.

The charge of this review asked SLAC management to present a plan for its program that respects current funding realities. These include the effects of the 2008 Omnibus funding bill in which the overall DOE SC funding was reduced by $503M (-1.1%) from the FY08 President's Request. HEP funding was reduced by -8.4% (-63M) from the FY07 level, which represented a 12.5% reduction from the FY08 request. In particular, the FY07 funding for HEP was $751M and the Omnibus bill reduced that to $688M in FY08. This caused the SLAC budget for FY08 to fall to $95.4M, $28.4M below the plan of $123.8M. The impact on the lab was considerable. B-Factory Run 7 had to be reduced from 10 months to 4 to reduce expenditures (mostly the power bill to run the linac). An additional reduction-in-force (RIF) of 100 employees was needed in addition to the 100 layoffs already anticipated in PPA as part of the originally plan for conclusion of B-factory operations at the end of FY08. The additional layoffs came in large part from the scientific computing departments at the lab as well as the accelerator R&D effort. The latter reduction was mostly due to the language of the Omnibus appropriation that singled out ILC R&D and superconducting RF for a ¾ reduction from the FY08 plan. The reviewers voiced their opinion that SLAC management had done an excellent job in dealing with the constraints of the FY08 Omnibus bill, but they also agreed that SLAC's impact and scope in PPA were seriously jeopardized by this funding shortfall.

In the next section of this report we present the reviewers' analyses of these issues broken out into various discrete topics that in total capture the entire SLAC program.

II. Topics with Findings, Comments and Recommendations proposed by the Review Team

1. Accelerator-based Particle Physics Program

1.a *BABAR* Run 7 and Intense Analysis Phase

Findings:

Achievements

- The PEP-II and *BABAR* experiment concluded a decade-long data-taking period in April 2008 at energies matching the 2S and 3S bottomonium states and it also performed an energy scan above the 4S state. These runs were accomplished under circumstances that resulted from the reduced PEP-II operation resulting from the FY08 budget cuts.

- The *BABAR* experiment continues to produce new physics results (and papers) at an unprecedented and unrivaled rate. A recent noteworthy accomplishment is the observation of the η_b from the 3S data.

Proposed Program

- The *BABAR* collaboration is focusing on the update and completion of 100 key analyses in an intense analysis period extending through 2010.

- Beyond 2010, the remaining analyses will rely completely on SLAC computing resources after which time those resources are expected to ramp-down.

Comments:

Achievements

- The PEP-II and *BABAR* teams are to be commended on the excellent performance of the accelerator and detector and the impressive body of scientific results obtained to date.

- The off 4S running was conceived and executed professionally under the difficult circumstances presented by the budget cuts.

- The observation of the η_b is a vindication of running off the 4S and is expected to be the first of many discoveries in this unprecedented dataset.

- SLAC physicists make significant contributions to important physics analysis activities, including the η_b result.

Proposed Program

- We strongly endorse the *BABAR* group's plan to follow through on their plans to complete the core analyses for the full data sample and SLAC should do what it can to see that this is done in a timely way.

- A broad program of research on many physics topics remains to be exploited by the collaboration, including b, c, τ and QCD studies.

- The collaboration will be challenged to maintain the current pace of physics results.

Recommendations:

1.b Accelerator-based Particle Physics Program – ATLAS

Findings:

- SLAC officially joined the ATLAS collaboration in July 2006.

- At present, the personnel involved consist of: 2 faculty, 13 scientific staff members, 2 engineers, 4 postdocs, and 5 students. The SLAC group currently has 6-8 members stationed at CERN.

- The SLAC group is participating in the commissioning of the ATLAS detector, for example the pixel system (C. Young is the current pixel system run coordinator), and the High-Level Trigger configuration initialization, the online database system proxy layer, partial-event building for calibrations, and improvements to developments of beam physics selection and beam spot-finding algorithms at level 2 and event filter stages. In at least one case (development of the interim M2O database communication proxy and work on the CORAL server developed by CERN and intended for this role), the SLAC group has picked up an activity suffering due to loss of CERN personnel.

- The SLAC ATLAS group has entered into a vigorous program of preparations for data analysis with the formation of the Jet/Missing Et/B-tagging working group led by A. Schwartzman. In addition, efforts to develop basic software components – simulation codes and the ability to overlay minimum bias events and other background detector activity – are under way.

- The SLAC ATLAS group has established a vigorous effort toward the phase-I and phase-II detector upgrades, partnering with ATLAS collaborators at LBNL and UC Santa Cruz. Efforts mainly aimed for the phase-II upgrade include: work on 3D-sensor pixel development (this includes participation in test-beam activities at CERN), CO_2 based cooling, data transmission for the tracker upgrade, the trigger/DAQ upgrade, as well as development of a Si pixel/strip system test-stand including trigger/DAQ. Contributions to the phase-I upgrade are also possible.

- SLAC has been designated by US ATLAS as a Tier-2 Computing Center.

- The SLAC ATLAS group and SLAC management foresee an opportunity to create a "West Coast" ATLAS user center that would serve scientists based at or visiting the lab who would benefit from the (computer) hardware infrastructure and resident expertise/intellectual activity – from both the experimental and theory communities.

- The proposed FY09 and FY10 budgets each include approximately $5M for ATLAS research and detector upgrade activities as well as funds required for operations and in support of the Tier-2 Center.

Comments

- The committee is impressed with the breadth and level of activity as well as the commitment of the SLAC group participating in ATLAS. The location of personnel at CERN is essential at this critical time for the experiment.

- The activities being pursued by the SLAC ATLAS group draw from existing strengths within the laboratory. These strengths include expertise in tracking systems, trigger and data acquisition systems, and computing. The laboratory's in-house expertise with Geant-4 is also being exploited.

- Coordinating with LBNL and Santa Cruz on the detector upgrade program is a natural and effective strategy.

- The group has attracted a highly talented set of postdocs and graduate students, as demonstrated by the impressive progress shown during the presentations in the breakout session and the high quality of the presentations themselves.

- Since the SLAC ATLAS program represents an expansion in the scope of activities for the US national program on ATLAS and the portion of the US program in proton-accelerator based experiments, the proposed role must be agreed to by ATLAS and US-ATLAS and evaluated within the national proton program.

- The committee believes the SLAC ATLAS group will need to grow to carry out the role envisaged. The SLAC ATLAS group should increase involvement from scientists and faculty who can play leadership roles.

- The committee finds the idea of a West Coast ATLAS physics analysis center based at SLAC to be an interesting one. However, the plan for this needs to be developed further before an evaluation of the real potential can be made. In particular, for the short term, the absence of personnel currently based at CERN may impact the timescale on which such a center can develop. Further studies of the size of the outside institution user base that would avail itself of such a center need to be carried out.

- The committee did not hear much detail about the status of the Tier 2 center.

Recommendations

- The SLAC ATLAS group should work together with SLAC management, DOE, and US ATLAS to define the role of SLAC in ATLAS, including the proposed physics analysis center based at the laboratory.

2. Non-Accelerator-based Particle Physics Program

2.a KIPAC Initiatives

Findings

Performance

- KIPAC was formed to bridge the theoretical and experimental physics communities; melding computation, experiment, observation and theory. Programs include GLAST physics and ISOC, LSST, SNAP, non-accelerator physics and theory, and R&D.

- KIPAC is funded from a number of sources including DOE, NSF, NASA, SLAC and private monies. In FY08 DOE is funding 19.2M towards KIPAC initiatives that supports 83.2 FTE involved in GLAST, LSST, SNAP and non-accelerator physics and theory.

- DOE HEP supported KIPAC achievements include:
  - Conducted research in non-accelerator physics and theory with focus on GLAST physics (dark matter, relativistic outflows, acceleration, etc), cosmology (dark matter and energy, lensing, structure formation) and particle astrophysics (black holes, jets, GRBs, etc). Publication of 160 DOE related papers in 2007.
  - LSST camera conceptual design review was held September 2007. Prototyping and design analysis has focused on the high-risk elements of the camera: sensor, shutter, filter and cryostat.
  - SNAP instrument electronics and software (DAQ and EGSE), development of star guider demonstrator and research in strong lensing in preparation for JDEM call for proposals expected in 2009.

Proposed Program

- Continue non-accelerator and theory research with focus on GLAST, cosmology and particle astrophysics.

- Operate the GLAST ISOC and perform GLAST science research as a member of the GLAST collaboration.

- LSST camera design and prototyping effort to support PDR in 2009 and first light in 2016.

- Continue SNAP instrument electronics and software prototyping, and participate in JDEM proposal.

Comments

Performance

- DOE supported particle astrophysics at SLAC is embedded in KIPAC. While KIPAC has emerged as an important focus for astrophysics at the intersection of cosmology and particle physics and is held in high regard by the community, it is somewhat difficult to identify and assess the DOE contributions.

- KIPAC's scientific productivity overall is very impressive and is comparable with world-class groups of similar standing. They have a strong publication rate of high quality research, excellent success in competing for ground and space-based observing time with oversubscriptions of typically 5-7x (e.g., Hubble

Space Telescope, Chandra, XMM), and a similar success rate in winning grant awards. The group successfully melds theoretical and experimental research.

- The expansion of SLAC's research program into astrophysics and the establishment of KIPAC has been very successful, as evidenced by their significant contributions to GLAST, LSST R&D, and theory.

- DOE's efforts have been highly leveraged by KIPAC's success in obtaining funds from multiple sources, including private.

- There is some concern over the loss of Steve Kahn as the KIPAC Deputy Director, both in terms of scientific leadership and project direction (e.g., LSST).

Proposed Program

- The DOE funded portion of KIPAC's future program aligns well with the Cosmic Frontier recommendations of the P5 report.

- KIPAC is well positioned to obtain exciting scientific return from GLAST.

- The proposed non-accelerator and theory research program is likely to continue to deliver science at the present exceptional level.

Recommendations

2.b GLAST and ISOC

Findings

Performance

- SLAC leads the LAT instrument development and ISOC development and operation for GLAST, and is a member of the GLAST collaboration.

- SLAC delivered the LAT instrument, completed development of the ISOC, supported GLAST launch and initial spacecraft and instrument checkout, and is presently processing, analyzing and archiving GLAST science data.

Proposed Program

- Operate the GLAST ISOC and perform GLAST scientific research as a member of the GLAST collaboration.

Comments

Performance

- SLAC should be congratulated on successfully delivering the LAT, completing the development of the ISOC and for supporting the launch and early activation of the telescope.

Proposed Program

- Based on the initial smooth operation of the ISOC processing software and systems, the SLAC group is in an excellent position to maximize the scientific output of the LAT and GLAST mission overall.

- The Scientific staff is well positioned to address core scientific questions enabled by GLAST including those related to the indirect detection of dark matter and new physics, relativistic outflow and particle acceleration.

- Staff members have assumed strong leadership positions in the GLAST collaboration and with their experience and success in multi-wavelength astronomy, are well positioned to conduct forefront research.

Recommendations

2.c LSST R&D

Findings

Performance

- LSST has the potential to make major discoveries in a wide range of fields including dark energy through weak lensing and including many aspects of the transient sky.
- LSST Camera conceptual design review was held in September 2007.
- Prototyping and design analysis has focused on the high-risk elements of the camera: sensor, shutter, filter and cryostat.

Proposed Program

- Proceed with LSST camera design and prototyping effort to support PDR and first light.

Comments

Performance

- The SLAC camera team has made excellent progress in key areas including mechanical, contamination and metrology, optics, sensor and the electronics; the camera development critical path has been identified and appropriate plans made.
- The LSST data base initiative seems extremely promising and should be pursued.

Proposed Program

- The SLAC team is well positioned to move forward in the key role of development of the camera for the LSST. The present prototyping work is well conceived and focused on the appropriate high-risk elements.
- The LSST data set size and expected usage drive interesting data base problems that SLAC will be well positioned to address.

Recommendations

2.d SNAP

Findings

Performance

- SNAP is a well designed, relatively mature stage IV dark energy experiment concept and a leading contender for the JDEM mission.

- SLAC has focused on the prototyping and analysis of SNAP instrument electronics and software (DAQ and EGSE), development of star guider demonstrator and research in strong lensing in preparation for the JDEM call for proposals expected in 2009.

Proposed Program

- Continue SNAP instrument electronics and software prototyping, and participate in JDEM proposal.

Comments

Performance

- The SLAC effort in flight qualified electronics and the silicon based star guider is appropriate and well matched to SLAC expertise.

- The work on the DAQ and EGSE electronics and star guider demonstrator appears to be appropriate for prototyping and risk reduction prior to the JDEM call for proposal.

Proposed Program

- We concur that SLAC should continue their present prototyping work until the outcome of the JDEM down-select is known.
- We note the potential for leveraging the expertise developed for GLAST data processing and archiving for use with SNAP.

Recommendations

2.e EXO-200/EXO

Findings

Performance

- EXO-200 is a new double beta decay prototype experiment soon to start taking data, with the potential to return important results on the nature of the neutrino and pave the way for a larger experiment.
- EXO-200 is designed to test operational configurations and procedures and is also expected to constrain the Majorana mass to between 133 and 186 meV (model dependent) in 2 years.
- The EXO-200 is being installed underground at WIPP.

Proposed Program

- If schedule is maintained, the first EXO-200 engineering run will be conducted in Q1-2 of 2009 and initiate the planned 2-year data run.
- Design work will be initiated on the full EXO experiment, a larger ton-scale version of EXO-200.

Comments

Performance

- The team has made good progress in the last year given the resource constraints.

Proposed Program

- The EXO-200 experiment is well designed to meet the stated goals and operate as an effective pathfinder for the full EXO.

Recommendations

3. SLAC THEORY PROGRAM

Findings

Achievements

- Particle Group has maintained a strong and broad program across key areas of forefront theory. It contributes greatly to the general particle theory community and is adapting a service program to ongoing experimental efforts. Lance Dixon's work on perturbative QCD is particularly significant.

- Astrophysics theory program is well matched to growing experimental effort here and has raised remarkable external support. It is very strong, and closely coupled to existing experimental effort, and potential other experimental DOE PA programs. Roger Blandford is an important intellectual leader.

- Both groups are remarkably successful at training and placing students and postdocs.

Proposed programs

- Both groups are well positioned to address emerging theoretical challenges. HEP's program of encouraging workshops, and supporting students, postdocs and visitors continues to be productive. KIPAC's program of merging outside funding opportunities with DOE funding, and continuing to focus on potential projects is also a good strategy.

Comments

Achievements

- HEP is a long established group with good track record. Their effectiveness may be enhanced with the ATLAS program developing on site.

Proposed programs

- There exists great potential for synergy in both groups with proposed experiments.

Recommendations:

- The lab should develop a plan to provide adequate support of particle astrophysics theory's new and evolving computational needs.

4. Accelerator Physics

4.a PEP-II Operations

Findings

- PEP-II terminated operations April 7, 2008, six months ahead of the planned shutdown due to the impact of the Omnibus bill.

- PEP-II delivered 557 fb^{-1} to BaBar over its 9 year operating life, and reached a peak luminosity of $1.2x10^{34}$ cm^2 sec^{-1}, a factor of four greater than the design luminosity.

Comments

- The PEP-II team is to be congratulated for the outstanding sustained performance of the collider over its ~10 year lifetime. Operating at 4 times the design luminosity is a remarkable achievement and sets a very high standard of performance for future colliders.

- PEP-II did groundbreaking work in many areas of accelerator science in order to handle and utilize such high current electron and positron beams. These innovations and this experience needs to be documented in a formal way to ensure adequate capture of this knowledge.

Recommendations

- SLAC should appropriately document the PEP-II design, performance, accelerator physics results and innovations.

4.b General Accelerator Research

Findings

- The Laboratory Management outlined as a strategic goal maintaining a strong program in accelerator research.

- The Accelerator Research program is directed at a very broad range of accelerator science, including R&D for linear colliders, advanced accelerators, LHC upgrades, advanced RF structures and sources, fundamental beam physics, advanced computation, and the operation and utilization of several test facilities.

- Due to the Omnibus bill, 21 PPA positions in the Accelerator Research Division were eliminated.

Comments

Achievements

- Accelerator Science at SLAC has a rich, impressive and influential history going back decades. Developments in accelerators and their associated technologies have enabled and continue to enable a broad range of science both within HEP and outside of HEP. There continues to be impressive progress in accelerator developments in many areas, as discussed below.

- Laboratory, PPA and Accelerator Research management have responded in a remarkable way to the many challenges that the laboratory and accelerator field have had to face in the last year. The Accelerator Research program has continued to produce high-quality results in spite of the various distractions.

Proposed Program

- The Accelerator Research Program and vision is aligned to the P5 goals. The energy frontier is engaged through major efforts in ILC (pending funding), continued advancement of the normal-conducting High-Gradient program, participation in LHC upgrades through the LARP program, and advanced acceleration methods based on Plasma Wakefield Acceleration and laser acceleration. The intensity frontier is engaged through collaboration on Project-X at Fermilab, and design efforts for a Super B-factory.

- There is a danger, however, of over-extending efforts, in an attempt to participate in all accelerator activities worldwide. It would be helpful to formulate a strategic plan with, say, a five-year time horizon, for Accelerator Research at SLAC. Such a plan would enumerate and help to focus the priorities and goals for the accelerator research programs at SLAC, incorporating both support of the existing user programs as well as those efforts aimed at future program development and fundamental research.

Recommendation

- Lab management should develop a five year strategic plan for accelerator research at SLAC compatible with DOE guidance on funding levels.

4.b.a Super-B Factory Studies

Findings

- SLAC staff are engaged in studies for a Super B-Factory, to be hosted in Italy, with a design goal of $1x10^{36}$ cm^{-2} sec^{-1}. The facility is based on the use of a new idea for a "crab waist" scheme, very small vertical β^* achieved with ILC final-focus type optics, and incorporating electron polarization.

- An option under discussion includes reuse of PEP-II magnets and RF systems in the Super B-factory. This would provide 70% of the needed Super-B magnets and all of the RF required. SLAC staff are making key contributions to the design, simulation and technical report preparation.

Comments

- The expertise in the PEP-II team is ideally suited to make a substantial contribution to the Super-B design.

4.b.b General Accelerator and Beams (Accelerator Physics, Computation)

Findings

- SLAC staff are contributing to the LHC through the funded LARP program in the areas of beam collimation and beam-beam simulations. A number of new initiatives have been proposed to LARP management including low-level RF system development, feedback to control electron-cloud driven beam instabilities, electron cloud remediation, crab cavity development, crystal collimation and studies in support of the CERN PS2. These proposed areas align with demonstrated expertise and core competencies in Accelerator Research at SLAC.

- A vigorous program of electron-cloud research continues in support of both high-intensity positron and proton machines. Notable recent developments include the measurement in PEP-II of i) the effect of beam scrubbing on secondary electron yields of TiN coated samples, ii) grooved chambers for SEY suppression, and iii) electron cloud dynamics in dipoles. These results provide key information for the design of future machines to limit electron-cloud effects. Continued work will focus on collaboration with experimental programs at other labs (KEK, CESR, FNAL and CERN).

- SLAC has made substantial contributions to ATF2 (Accelerator Test Facility 2) at KEK, a testbed for the ILC final focus systems. SLAC contributions include ~30 magnets, movers and power supplies, beam position monitor electronics and other beam instrumentation as well as support in the design, operation and commissioning of ATF2. SLAC leads the Beam Delivery System for the ILC,

of which the ATF2 activities are one component. Other activities have focused on interaction region design, integration and interface specification and crab cavity development

- The Beam Physics Department is pursuing a number of activities ranging from direct support of existing or future SLAC programs (LCLS, FACET, PEPX) to fundamental beam physics of relevance to accelerator performance at other worldwide facilities.

- The Advanced Computations Department pursues a broad range of accelerator technology and beam dynamics topics. Utilizing a powerful set of higher-order finite-element codes, the AC Department is delivering impressive results on LHC collimator and crab cavity systems, high-gradient structures, RF guns, ILC cryomodule trapped modes and beam-breakup in the CEBAF 12 GeV cryomodules.

Comments

- With the shutdown of PEP-II coupled with the reduction in ILC efforts in FY08, the Accelerator Research staff are exploring many potential avenues for continuing a vigorous accelerator R&D program. The work continues to be of very high quality and relevance, covering a broad range of areas by capitalizing on the core capabilities at SLAC.

4.b.c ILC R&D

Findings

Achievements

- SLAC has a long history in linear collider research, including the design and construction and operation of the only linear collider ever built.

- SLAC has been deeply involved in ILC studies. SLAC made a major contribution to the RDR. ILC activities were redirected in response to severe budget cuts following the Omnibus appropriations bill. Several employees were terminated, particularly from the ILC engineering effort, which will impact the engineering capabilities going forward.

- SLAC has built parts for a future L-band sheet-beam klystron. Progress was made with the Marx generator, which produced full voltage but had problems. Quadrupole centre stability could be measured to 0.1 micron resolution, and

stability to 2 microns could be demonstrated. Considerable contributions were made to ATF2.

Proposed Program

- Assuming that the budget returns to its previous level, SLAC is committed to continue its well defined ILC R&D program, which is concentrated around the electron source, the BDS, the RF sources and RF distribution and the system integration.

Comments

Achievements

- The recent achievements are remarkable considering the present financial situation. The team quickly adapted to the new situation, making best use of in house expertise. Specific work on ILC subjects was redirected.

Proposed Program

- ILC R&D should be supported at an appropriate level in order to address remaining high priority issues of a future linear collider.
- SLAC's ILC R&D program is clearly defined within the GDE. SLAC competency is well matched to the program.

4.b.d High Gradient R&D

Findings

Achievements

- The HG study has made measureable progress and has gained considerable momentum. NLCTA and very soon also Accelerator Structure Test Area (ASTA) form a unique set of facilities for X-band high gradient tests. In addition to the existing US HG collaboration, which SLAC hosts, strong collaborations with CERN and KEK have recently led to excellent results. Together with other US labs, extensive studies on frequency scaling are continuing and a better understanding of the physics limiting the acceleration gradient could be reached.

Proposed Program

- SLAC proposes to continue and even intensify this program. A study of improved output structures for the X-band 75 MW klystrons was presented. The idea of a dedicated two-beam test-facility (STF4) at SLAC was also put forward.

Comments

Achievements

- The increased importance of the HG work in the present context of reduced ILC funds is very visible. SLAC's core expertise is optimally used in this field; the recent success in the true global collaboration with CERN and KEK (achieved > 100MV/m with the "T18" structure) is remarkable and all partners can be congratulated for this.

Proposed Program

- The continued support of HG research is appropriate. To make best use of the existing facilities, infrastructures and expertise, it is important to sustain the good relationship between the Accelerator Technology Research group and the klystron department, especially in view of the planned work on X-band high power klystrons.

- Without a high energy physics accelerator on site, it is not very clear whether HEP or BES should be responsible for the accelerator research. This is less in doubt for high gradient research program, but for the identified core competency of RF component fabrication (and beam physics) this remains a concern that should be addressed, otherwise these fields will become orphans.

- The high gradient research at SLAC and within the US HG collaboration constitutes a healthy program and it is recommended to pursue it for the coming years to allow an informed decision on the technology and energy reach of a future linear collider.

- STF4 was presented but not in sufficient detail to allow an assessment.

4.b.d Plasma Wakefield "FACET" & Laser Acceleration

Findings

Achievements

- The FACET proposal was presented.

- E-163 (Laser acceleration) successfully demonstrated atto-second bunch generation and first acceleration with light. Commercially available fibres and lithographically produced Si band-gap structures are used.

Proposed Program

- The FACET proposal uses the beam of two thirds of the existing linac for a well defined beam driven plasma wakefield acceleration experiment. The proposal includes the creation of separated drive and witness bunches with clear energy spectra, and a scheme to accelerate positrons with either positron or electron drive bunches. A believable concept of a plasma wakefield acceleration based linear collider was presented.

Comments

Achievements

- The capabilities at SLAC are unique in the world for exploring beam driven plasma wakefield acceleration.

- The laser acceleration experiment in NLCTA is valuable and the results are encouraging. It should however be noted that some key components for the experiments – the laser and the commercial silica fibre – are not using in house R&D competencies, which represents a certain risk. It would be fruitful for the laser acceleration experiment to attract other, external groups of experts, both academic and industrial, to become interested to take responsibilities in this program.

Proposed Program

- SLAC is the only facility in the world, where a beam driven wakefield accelerator experiment is possible today. This is a unique possibility that should not be missed, since the scientific case is strong. The proposal as such is interesting and sound. It uses the part of the existing linac which is not used by LCLS and thus seems to fit well into SLAC's overall program, making optimum use of existing infrastructures. It also relies on core in house competency in an optimal fashion.

4.b.f End Station A

Findings

Achievements

- End station A cannot presently be used, since its Personal Protection System (PPS) requires update. The transfer line to ESA is fully equipped.

Proposed Program

- The proposal is to update the PPS system and create a test beam facility in end station A to allow detector tests

Comments

Achievements

Proposed Program

- The cost of $500K to update the PPS system for a future use of ESA is sound, if the need for test beams is confirmed.

5. Detector R&D (includes SiD, SuperB, simulations, EXO, and KIPAC activities)

Findings

- SLAC's program in detector R&D is aligned with P5. That committee recommended enabling future frontier experiments with detector R&D, including future lepton colliders and neutrinoless double beta decay.
- Designing new experiments requires understanding the physics challenges, accounting for the experimental environments, identifying and/or developing suitable detector technologies, integrating sub-detectors into realistic technical designs, and simulating/benchmarking detector performance. SLAC is able to address this entire suite of tasks.
- SLAC has core competencies in electrical and mechanical engineering that are highly experienced and world class (these are essential for detector R&D).
- SLAC is engaged in an innovative silicon detector R&D program for next generation silicon trackers. R&D is motivated by the needs of a future linear collider, but the R&D is likely to have broader application to, for example, LHC & SuperB. The focus is on an innovative double metal sensor design that seeks to minimize tracker material and utilizes KPiX readout

- SLAC has developed KPiX an integrated readout for trackers, calorimeters, muon chambers.

- Simulation is essential to optimally design detectors for the Terascale. The SLAC simulation & reconstruction team is a leader. It supports an ambitious physics and detector simulation, reconstruction & analysis effort. The simulations are not technology or concept limited. These simulations have been used or are being considered for use in designing detectors in other disciplines or fields.

- A simulation reconstruction and analysis framework exists, core functionality is available, an individual particle reconstruction template has been developed, and various analysis algorithms implemented, but much remains to be done in this area.

- The simulation group are currently engaged in characterizing and optimizing the performance of the silicon detector concept (SiD).

- KIPAC has a broad range of detector R&D some DOE funded, most not. Some of the work that might be of interest to DOE are preparations for a large scale TeV gamma ray astronomy experiment AGIS. KIPAC is in a position to play a lead role on AGIS leveraging on SLAC's Application-Specific Integrated Circuit (ASIC) experience for GLAST. KIPAC is also developing the SiPM (Silicon Photo-Multiplier). The photon collection power per cost is competitive with multi-anode PMTs. The technology could be used in a variety of applications, including as a suitable light detector for AGIS. Amongst the KIPAC work not funded by DoE the QUaD CMB detector development has benefitted from the expertise in SLAC core competencies.

Comments

- The detector R&D programs at SLAC are important and broad, and SLAC physicists play leading roles. The efforts are well-leveraged on SLAC core competencies. The work is of very high quality.

- The committee believes that KPiX is an innovative and interesting direction to pursue.

- KIPAC has made significant contributions to detector R&D.

- SuperB. There are considerable uncertainties in the evolution of the project. At this juncture it is therefore appropriate to support modest engagement in accelerator and detector R&D until the uncertainties are resolved. In this regard, the work on picosecond level timing for TOF and DIRC based on microchannel plate PMTs seems promising. This activity has the potential to have a large impact on the physics reach of a super-B detector and should be supported.

Recommendations

- Future detector R&D, for SLHC, SuperB, and ILC, and other new experiments, will need beam tests.
  In the US, only Fermilab has a suitable test beam, but it may be oversubscribed. SLAC has sketched a plan to provide test beams. SLAC should develop a case for a test beam and submit it to the DOE for evaluation.

6. Scientific Computing

Findings

- The Scientific Computing and Computing Services (SCCS) department at SLAC supports scientific computing and also provides general computing support at the laboratory.

- In recognition of its broad mission, the SCCS department was moved to the operations part of the laboratory.

- SCCS has expertise in a broad set of scientific computing areas.

- The SCCS department comprises roughly 90 FTEs.

- The funding of SCCS is complex. Its total operating budget in FY08 was approximately $13M ($17M if indirect charges are added). These funds are obtained through a mixture of sources, including contributions from BES (30%), indirect costs (56%) and direct contributions from PPA projects (14%).

- The largest scientific computing activity at present is BaBar at a scale of ~7000 cores and ~3 PB of total storage.

- PPA has resolved to protect computing for ongoing projects (principally BaBar and GLAST) in the face of the difficult budget situation.

- Work on GEANT4, though valued throughout the HEP community, was not a formal SLAC responsibility and therefore suffered significant cuts as a result of the FY08 funding situation.

- As BaBar winds down, the lab proposes to redirect its resources to ATLAS to create a "West Coast" analysis facility.

- SCCS is involved in some advanced computing techniques relevant to data analysis—e.g., Extremely Large Data Base (XLDB) development for LSST. This has led in the direction of collaboration with industry. These experts (including academic computer scientists) from industry will be sited at SLAC.

- The role of SCCS continues to evolve. Planning efforts, which involve discussions with PPA, Kavli, BES, and the Stanford campus, are ongoing, but have not resulted in a definitive plan.

Comments

- SCCS should be commended on its excellent work and leadership in support of BaBar. The efforts of SCCS were clearly essential to its overall success.

- Virtually all PPA projects depend critically on computing. A well functioning SCCS department is therefore vitally important.

- Careful planning will be needed to accommodate the transition from BaBar to other projects. In particular, ATLAS and GLAST have to some extent enjoyed an effective subsidy in the form of existing BaBar infrastructure.

- BES will also present computing needs that may differ significantly from those typical of PPA projects. Given that BES is already making a significant contribution to the operation of SCCS, it will be important to understand these needs and to formulate plans to address them.

- The lab should continue with its ongoing planning efforts for SCCS. Key issues to be addressed include: a clearer understanding of how costs are allocated, the transition from BaBar as the dominant user to an era where GLAST and ATLAS are the main SCCS users, cosmological computing, accelerator modeling, and accommodation of the needs of BES. In addressing the final point, SCCS should study computing support provided to BES users at other labs.

7. BaBar D&D

Findings

- The BaBar detector will be disassembled and the components will either be stored, reused or sent to salvage. The disassembly project is well defined at this point and management has followed the advice of the Aug 08 review. The estimated cost is $15.1M compared to the $10M estimate done last year. This is a large complex device, which weighs 120 tons.

- One of the project uncertainties is whether the metal components of BaBar will be subject to the DOE metals moratorium, which applies to material that may be activated by accelerators.

- Frascati is interested in using many components from BaBar in the case that SuperB goes forward.

Comments

- The BaBar disassembly plan was covered by an excellent presentation on Tuesday. The key team members are chosen and have the knowledge and expertise to complete the task.

- It should be a very high priority to develop a process to deal with the metal components of BaBar and to get buy in from the EH&S department, the Stanford Site Office and other DOE offices. Support from the laboratory management in this area would be helpful.

8. PEP-II Decommissioning

Findings

- PEP-II is moving to a minimum maintenance state following its shutdown in April. The technical plan to bring it to a minimum maintenance state is well understood. This is currently the responsibility of the PPA. Following the early shutdown and budget cuts, the planning for bringing it to a minimum maintenance state has not progressed much since the review last August.

Comment

- The end point for the project is currently undecided and will depend on future events such as whether PEP-X goes forward and or Frascati proceeds with

SuperB. The deconstruction project for PEP-II is not very far along. It lacks a project manager, a project structure, and estimated cost or an agreed upon end state. This is potentially a major future liability for DOE.

Recommendation

- The PEP-II D&D should be projectized, including putting PEP-II into MMS. The responsibility and management of the PEP-II D&D should be moved out of the PPA division, since its mission is science not D&D. PEP-II is better dealt with at the laboratory level.

9. Organization/Transition and Strategic Planning/Priorities

9.A The transition in the PPA Science Program

Findings

- The Particle Physics and Astrophysics Division is in the midst of a major challenging transition from an accelerator based particle physics program centered on BaBar and PEP-II to one that will be centered on ATLAS at the LHC. Until April when operations were terminated, the B-Factory was one of only two remaining U.S. accelerator based experiments in high energy physics. The PPA Director and the assistant PPA directors for Elementary Particle Physics and Particle Astrophysics and Cosmology have transitioned the PPA Division efforts to a program that is much more diverse and includes important efforts in LHC Atlas at CERN; the science operations of GLAST, a major NASA satellite mission; EXO, a major non-accelerator experiment; a major program in advanced accelerator R&D; and participation in two proposed astrophysics surveys focused on dark matter and dark energy, LSST and SNAP. While nearly all of these elements have their origins in initiatives prior to the BES stewardship of SLAC, this transition has occurred at the same time that SLAC is making the transition to a multi-program laboratory..

Comment

- The program is exciting and well aligned with the recent P5 report and the transition to this program is well along.

9.b The Completion of the Transition of the Stewardship of SLAC to BES

Findings

- This major change is embedded in a larger change in the focus of SLAC as it completes its transformation from a laboratory dedicated to accelerator-based particle physics to a multi-program laboratory embracing several very different cultures. The changes in the SLAC program are already giving SLAC leadership roles in the rapidly changing research directions of photon science, particle astrophysics and cosmology.

- This transformation was made even more difficult to carry out when the budget created by the FY2008 Omnibus Appropriations Bill forced the premature terminations of BaBar Operations and an involuntary staff reduction.

Comment

- The transition of the operation of the Linac from particle physics to photon science is nearly complete. A plan to continue advanced accelerator R & D under the stewardship of OHEP has been developed. It will use the two thirds of the Linac that will not be used in the mid term by BES without disrupting Linac operations for photon science.

- The SLAC management has strengthened and expanded its connections with the campus as will be noted elsewhere.

- The Laboratory Director and the PPA Director are doing an excellent job of guiding the SLAC though such a challenging and necessary transformation. They and the staff are reinventing SLAC. They have provided the SLAC staff with a clear vision for the future of PPA and that vision is both challenging and very ambitious. It flows down to the Assistant Directors and it is shared by the staff.

9.c The PPA Strategic Plan

Comment

- The broad strokes of the strategic plan for the PPA Division are clear. However, not all of the elements are as well developed as GLAST and EXO. This is not surprising because the plans for participation in large survey using astronomical tools represent an emerging direction for particle physics that will rely on working with new partners within the Federal Government. The integration of the full range of capabilities of PPA into the long established organization of U.S. and International Atlas will need tact and careful planning. The emerging proposal for a U.S. western center based on SLAC, LBNL and UCSC should be encouraged. It has the potential to enhance the role of the US participants in ATLAS. Nevertheless the sum of all of the elements of the strategic plan for PPA is very ambitious and will need considerably more resources that PPA has

at present. It is unlikely that DOE OHEP can provide all of these resources and the Laboratory and DOE will have to make choices to provide a sustainable and world class contribution to the US program in particle physics and astrophysics, which is centered on great challenges in particle physics.

9.d The Transformation of the SLAC Organization

Findings

- All of these changes are moving forward rapidly as are the changes in the SLAC organization that must be made to accommodate the new and evolving programs.

- The transition to the Laboratory Organization that is needed to support the new programs is not complete. It should not be surprising that some organizational issues have emerged in the process of making these extensive changes.

Comments

The role of scientific computing in SLAC

- The role of scientific computing in SLAC is still being defined. The participation of PPA in the LHC program and LSST and the curation of the BaBar data will lead to enormous challenges for SLAC's scientific computing enterprise. The enormous scale of the data volumes will require the development of new strategies in order to extract science in a timely, efficient fashion. The photon science community is beginning to recognize, perhaps belatedly, that the total data volume that the LCLS instruments will generate will be comparable to the data volumes generated by ATLAS and LSST. These volumes will create new opportunities in science, provided the old way of doing business are discarded. The SLAC Directorate recognizes these challenges and has set up mechanisms to explore how scientific computing should be employed at SLAC in the future.

The Place of PEP-II Decommissioning in the SLAC Organization

- The location within the SLAC management organization of the management team that will oversee the activities that will place PEP-II into a minimum maintenance state (MMS) and develop a D&D plan is unclear. The Laboratory needs to establish a clear plan for the PEP-II facilities and then create a project organization with the resources and mandate to implement the plan. As noted elsewhere, the PPA Division does not seem to be the appropriate place, because many of the personnel who would do this work will be engaged in the advanced accelerator R&D program. On the other hand, the PPA planning to place BaBar into a minimal maintenance state and later to dismantle it is well advanced. It is appropriate for PPA to complete this work. The leadership of PPA is well aware

of the situation and the Laboratory can be expected to move forward with PEP-II once the issue of its long term use is resolved and resources are dedicated to the activity.

Comment

The Lab's Reorganization

- The Laboratory and the PPA Division in particular are to be congratulated for sustaining a world class science program in PPA in the midst of major changes and for making the organizational changes to needed to sustain this program.

Appendix 1. Links to the SLAC 2008 Review

The SLAC talks presented at the review and associated background material can be found on the web at http://www-conf.slac.stanford.edu/programreview/2008/default.asp

Appendix 2. Charge to SLAC Management

Dr. Steve Kahn
Director of Particle and Particle Astrophysics
Stanford Linear Accelerator Center
2575 Sand Hill Road
Menlo Park, California 94025

Dear Dr. Kahn:

The institutional review of the high energy physics research program of the Stanford Linear Accelerator Center (SLAC) by the Office of High Energy Physics (OHEP) of the Department of Energy (DOE) is scheduled for July 7-9, 2008. As I have discussed with you at an earlier date, the OHEP is in the process of being reorganized and one consequence of this change is that onsite lab reviews will not be annual events in the future. Instead, we anticipate that large, institutional reviews of the multipurpose labs with significant HEP support will occur on a rotating basis. The focus of each of these reviews will be the role and assessment of each lab's program to the national HEP program and an assessment of its performance and planning.

During this particular review, we would like to hear a discussion by SLAC laboratory management of the overall balance and priorities of the lab's research program as well as a presentation and discussion of the ongoing reorganization of the lab's divisions.

We ask that you address SLAC's efforts in the following major areas of research:

- B-Factory physics program, emphasizing run 7, and the plans to analyze the data accumulated over its life time;
- B-Factory shutdown and plans for the disassembly of BaBar and the minimum maintenance state of PEP-II;
- Participation in the LHC research program, both in the accelerator and the ATLAS experiment;
- Other ongoing experimental physics programs, including GLAST, EXO-200, etc.
- Theoretical particle physics and the KIPAC program in astrophysics, and cosmology, and the impact of these programs on the lab's experimental program;
- Advanced accelerator R&D facilities, including FACET and the NLTCA; and ongoing R&D including high gradient research and the ILC ;

- Research and development efforts to support the above programs and proposed efforts in EXO, LSST, SNAP, etc.

The FACET proposal was recently reviewed by the OHEP. Please make its report available to the reviewers in advance of July 7.

For each of the major areas of the lab's proposed research program, the consultants will be asked to comment upon:

- Scientific significance and technical merit of the area
- Quality and impact of recent research in this area
- Competence and future promise for carrying out the proposed plan
- Adequacy of the allocated resources and cost-effectiveness of the investment
- Feasibility for carrying out the proposed plans
- Comparison with research at other laboratories

We will ask our consultants to provide overall evaluations of: (i) the quality of the support and infrastructure provided by the laboratory; (ii) the goals for the research program over the next three years, (iii) and the long-term research plan for the laboratory.

As we have done in past DOE program reviews, we will invite our consultants to provide immediate feedback to the Laboratory, but we will also request from them confidential statements in writing that will be used in our evaluation of your program.

John Kogut will chair the review and serve as our contact on all aspects of the review. A tentative list of members of the review committee is enclosed for your information. In a recent survey of our consultants, all have expressed the need and appreciation for receiving any material available from the Laboratory prior to the review. We trust that you will try to comply with this request as much as possible, and at the very least by posting presentations from this past year's review.

We look forward to this important event.

Sincerely,

Dennis Kovar
Acting Associate Director
Office of High Energy Physics

Enclosure

cc: R. Orbach, SC-1

P. Drell, SLAC

P. Golan, SSO

Appendix 3. Agenda of the Review

DOE PPA Program Review

July 7-9, 2008

(click on the slides link to view presentation materials)

Monday, July 7, 2008 – Redwood Rooms A-D

Start Time	Topic	Speaker			Duration (min)
7:30 am	Continental Breakfast for Committee Members and Speakers				30
8:00 am	Executive Session				30
8:30 am	Welcome	P. Drell			10
8:40 am	Particle Physics and Astrophysics at SLAC	S. Kahn	ppt		30+5
9:15 am	Present and Future Program for EPP	D. MacFarlane	ppt		25+5
9:45 am	PEP-II in Run7 and Transition Planning	J. Seeman	ppt		25+5
10:15	Break				20
10:35 am	BABAR Overview and Plans	H. Jawahery	ppt		35+5
11:15 am	BABAR Physics Results	S. Prell	ppt		35+5
11:55 am	Lunch				50

12:45 pm	HEP Theory	M. Peskin		pdf	25+5
1:15 pm	LHC Program at ATLAS	C. Young	ppt		20+5
1:40 pm	ATLAS Upgrade R&D and Plans	D. Su	ppt		20+5
2:05 pm	ATLAS Physics Preparations	A. Schwartzman	ppt		20+5
2:30 pm	Break				10
2:40 pm	Present and Future Program for Particle Astrophysics and Cosmology	R. Blandford	ppt		25+5
3:10 pm	GLAST Program and Science Status	R. Cameron	ppt		20+5
3:35 pm	LSST Program and Development Status	K. Gilmore	ppt		20+5
4:00 pm	SNAP Program and Development Status	A. Roodman		pdf	20+5
4:25 pm	The EXO Double Beta Decay Program	P. Rowson	ppt		20+5
5:15 pm	Executive Session				75
6:30 pm	Adjourn				
7:00 pm	Dinner by Invitation				

Tuesday, July 8, 2008 - Redwood Rooms A-D

Start Time	Topic	Speaker			Duration (min)
7:30 am	Continental Breakfast for Committee Members and Speakers				30
8:00 pm	Detector R&D in SLAC PPA	J. Jaros	ppt		20+5
8:25 am	Present and Future Program for Accelerator Research	T. Raubenheimer	ppt		30+5
9:00 am	ILC Program at SLAC	N. Phinney	ppt		20+5
9:25 am	High Gradient Program	S. Tantawi	ppt	pdf	20+5
9:50 am	Plasma Acceleration Research and FACET	M. Hogan		pdf	20+5
10:15 am	Scientific Computing at SLAC	G. Dubois-Felsmann	ppt	pdf	25+5
10:45	Break				15

11:00 am	**Start Breakout Sessions**				
	Experimental Accelerator-Based Physics - Redwood Rooms A&B	**Session Chair: D.Leith**			
11:00 am	ATLAS Trigger and DAQ Projects	R. Bartoldus		pdf	15+5
11:20 am	High-level Trigger Algorithm Development	I. Aracena	ppt	pdf	15+5
11:40 am	New Approaches to Hadronic Final State Reconstruction	D. Miller	ppt		15+5
12:00 pm	ATLAS Tracker Upgrade Projects	M. Kocian	ps	pdf	15+5
12:20 pm	Lunch - ROB patio				50
1:10 pm	Simulation and Particle Flow Calorimetry for Future Linear Collider Detectors	N. Graf	ppt		15+5
1:30 pm	Silicon Tracking/Silicon Readout R&D	R. Partridge	ppt		15+5
1:50 pm	Overview of BABAR Activities at SLAC	B. Ratcliff	ppt		15+5
2:10 pm	Studies of Upsilon Spectroscopy	P. Grenier		pdf	15+5
2:30 pm	New Charmonium-like States	A. Gabareen-Mokhtar	ppt		15+5
2:50 pm	D0-anti-D0 Mixing at BABAR	J. Coleman	ppt		15+5
3:10 pm	Charmless B Decays at BABAR	M. Graham	ppt	pdf	15+5
3:30 pm	Detector R&D for SuperB and Other Future Applications	J. Va'vra		pdf	15+5
4:00 pm	Break				30
4:30 pm	Executive Session				90
6:00 pm	Site Tour				60
7:00 pm	Adjourn				
	Experimental Non-Accelerator Physics - Cypress Conf Room	**Sessions Chair: G. Madejski**			
11:00 am	Non-accelerator Session Overview	G. Madejski			5
11:05 am	GLAST - Status and Prospects	S. Digel	ppt		20+5
11:30 am	GLAST and Beyond GLAST: TeV Astrophysics	G. Madejski	ppt	pdf	15+5

11:50 am	GLAST and GRBs	E. do Couto e Silva		pdf	15+5
12:10 pm	Lunch - ROB patio				60
1:10 pm	Current Dark Energy Research at KIPAC	S. Allen	ppt		20+5
1:35 pm	Dark and Luminous Matter in Cluster Mergers	A. von der Linden	ppt		15+5
1:55 pm	LSST Camera Status	K. Gilmore	ppt	pdf	15+5
2:15 pm	LSST Data Structure and Management	J. Becla	ppt		15+5
2:35 pm	SNAP Electronics	G.. Haller			15+5
2:55 pm	QUaD and Development for Future CMB Experiments	S. Church	ppt	pdf	20+5
3:20 pm	Detector R&D in KIPAC	H. Tajima	ppt	pdf	15+5
3:40 pm	EXO 200 Progress	L. Yang		pdf	15+5
4:00 pm	Break				30
4:30 pm	Executive Session				90
6:00 pm	Site Tour				60
7:00 pm	Adjourn				
	Theoretical Particle Physics and Particle Astrophysics - 3rd Floor Kavli Conf Room	**Session Chair: R.Blandford**			
11:00 am	Introduction of HEP Theory Group and Structure	M. Peskin		pdf	20+10
11:30 am	Introduction of KIPAC Theory Group and Structure	R. Blandford	ppt		20+10
12:00 pm	Lunch - Kavli patio				60
1:00 pm	Searching for more General SUSY Models at the Tevatron	M. Lisanti		pdf	15+5
1:20 pm	SUSY Breaking, Sequestering, and String Theory	D. Green		pdf	15+5
1:40 pm	Computational Adaptive Mesh Refinement Cosmology	M. Turk		pdf	15+5
2:00 pm	New Approaches into Confinement and Duality in QCD	M. Unsal		pdf	15+5

2:20 pm	Numerical Simulations of Relativistic Jets	P. Wang	ppt		15+5
2:40 pm	BlackHat: NLO QCD for LHC	D. Forde	ppt		15+5
3:00 pm	Numerical Simulations of Gamma Ray Bursts	S. Akiyama		pdf	15+5
3:20 pm	Future Dark Energy Surveys	R. Wechsler	ppt		15+5
3:40 pm	Weak Lensing of Clustered Galaxies	E. Morganson	ppt	pdf	15+5
4:00 pm	Break				30
4:30 pm	Executive Session				90
6:00 pm	Site Tour				60
7:00 pm	Adjourn				
	Accelerator Physics - Orange Room	**Session Chair: T.Raubenheimer**			
11:00 am	E163 and Laser Acceleration	E. Colby	ppt	pdf	25+5
11:30 am	Electron Cloud R&D at SLAC	J. Ng	ppt	pdf	25+5
12:00 pm	Lunch - Orange Room patio				45
12:45 pm	ATF/ATF2 Experiment and BDS Program	A. Seryi	ppt		25+5
1:15 pm	L-band and X-band rf Sources	C. Adolphsen	ppt		30+10
1:55 pm	NLCTA and ESA Programs	C. Hast	ppt		20+5
2:20 pm	LHC Accelerator Research	T. Markiewicz	ppt		20+5
2:45 pm	Super B Studies	U Weinands	ppt	pdf	20+5
3:10 pm	Beam Physics at SLAC	Y. Cai	ppt	pdf	20+5
3:35 pm	Advanced Computation R&D	C. Ng	ppt		20+5
4:00 pm	Break				
4:30 pm	Executive Session				90
6:00 pm	Site Tour				60

7:00 pm	Adjourn				
	BABAR and PEP-II DND - 2nd Floor Kavli Conf Room	**Session Chair: D.MacFarlane**			
11:00 am	BABAR Overall DND Strategy	W. Wisniewski	ppt		30+5
11:45 am	BABAR DND Project and Planning	J. Krebs	ppt		40+5
12:20 pm	Lunch - Kavli patio				60
13:10 pm	Overview of PEP-II Minimal Maintenance State and Deactivation and Decommissioning	J. Seeman	ppt		30+5
1:45 pm	Inventory and Dispersal of PEP-II Accelerator Hardware	M. Sullivan	ppt		20+5
2:10 pm	PEP-II DND Engineering Planning	S. DeBarger	ppt		20+5
2:35 pm	Break				
4:45 pm	Executive Session				90
6:00 pm	Site Tour				60
7:00 pm	Adjourn				

Wednesday, July 9, 2008 - Redwood Rooms A-D

Start Time	Topic	Speaker			Duration (min)
7:30 am	Continental Breakfast for Committee Members				30
8:00 am	SLAC PPA Long-Term Planning and Responses to Questions - CLOSED	S. Kahn			60
9:00 am	Executive Session - CLOSED				180
12:00 pm	Working Lunch				60
1:00 pm	Closeout with PPA Directors				60
2:00 pm	Adjourn				

Appendix 4. **Reviewers, Participants and Observers**

Review Committee

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